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TRANSACTIONS

OF THE

AGRI-HORTICULTURAL SOCIETY

OF

WESTERN INDIA.

No. II. JULY, 1843. Quarterly Issue.

At a *General Meeting* of the Agri-Horticultural Society of Western India, held in the Society's Gardens on the evening of Thursday, the 25th May, the following gentlemen were present:—

The Honourable G. W. Anderson, in the Chair.

The Lord Bishop; Honourable James Henry Crawford; H. H. Glass, Esq. C. S; A. Spens. Esq., C. S.; Colonel Hughes, C. B.; Lieut.-Col. Dunsterville; Dr J. Burnes, K. H.; Dr R. Brown; Dr C. Morehead; Major Jacob; Dr J. G. Malcolmson; Captain Swanson; R. W. Crawford, Esq.; John Macleod, Esq.; Dr Mackie; Dr D. Shaw; Cursetjee Jamsetjee, Esq.; Manockjee Cursetjee Esq.; Rustomjee Cursetjee Moody, Esq. of Surat; Dr Geo. Buist, and Dr. H. Giraud, *Secretaries.*

The Minutes of the Meeting of the 15th February, and that of the General Committee of the 2d April, having been read, the following report of the proceedings of the Society was laid before the Meeting by the Secretary:—

Since last meeting Mr Shannon, Superintendant of the Society's Gardens, had left their employment. The circumstances under which this occurred were detailed at length in the General Minute of the 2d April. Mr Shannon was now in the employment of Messrs Brownrigg and Co., and had written a letter, expressive of his grateful acknowledgments, to the Secretary for the kindness and attention uniformly shewn him while in the service of the Society. It was left for the present meeting to determine whether the experiment of getting another gardener from Scotland should be repeated, or whether some one of those now candidates for Mr Shannon's appointment should not be selected. It was essential that some European should be fixed upon with as little delay as possible, even should he not be so perfect in his accomplishments as a gardener as might be desired. Both Secretaries

had resided for some time in the bungalow built for the accommodation of Mr Shannon. Dr Giraud, indeed, had remained there for some weeks together, for the purpose of superintending personally the operations of the Garden. They were satisfied, from what they saw, that not one-third of the work was done under the direction of the Garden Purvoe and Head Malley only, which would, without the slightest trouble, be accomplished under the most ordinary European supervision. Besides, whatever was effected in this way was work of routine only: any operation which was new or unusual absolutely stood still whenever the Secretaries turned their backs about.

Since the General Meeting of February, the gardener's house, already referred to, had been completed; it was at present unoccupied, but the Secretaries could, from personal experience, speak of the excellency of its plan, and the extent and comfortableness of its accommodation. They had found it sufficient for themselves and as many visitors as they thought fit for weeks together.

The lodge within the garden for occupation during the day, and for sale of seeds, &c. had also been completed and fitted up, and was now ready for being put in use.

The terrace had been finished, and the wire fence formerly described set up; a particular portion of this was in process of erection round other parts of the Garden. Of this a full account would appear in next number of the Society's Transactions, to be published in the beginning of July. It seemed eminently fitted for ornamental enclosure, being not only very much cheaper than the heavy dead walls, or clumsy wooden railings usually found surrounding the flower gardens in Bombay, but was equally efficient as a fence, and infinitely more light, graceful, and airy. A plan for gates of a corresponding style would be laid before the Meeting, which would be able to judge whether the expense of their construction ought or ought not to be at present incurred.

Twelve copies of the five numbers of the Transactions sent to be printed in Scotland had arrived by last steamer, and were ready for distribution; the remainder might be expected early in June.

No. I. of the Society's Quarterly Issue had been published in the first week of April; copies had been presented to most of the newspapers, and been noticed generally in a manner very gratifying to the Society. Although circulars had been very extensively distributed before publication, the number of orders that had been sent in was most discouragingly small. Copies, however, had been sent to all the members of the Society, whether they had sent orders or not; and it was imagined that they might be considered subscribers, unless they expressed themselves to the contrary. Still, if the sales did not very considerably go beyond even this, the cost of printing would draw heavily on their funds: a circumstance not contemplated when the publication was resolved upon. The expense of the first year would be quite sufficient to enlighten them on this point.

The following letters had been received on the subject from the Secretaries of the Bengal and Agrah Societies:—

"Society's Room, Town Hall, Calcutta, 1*st May*, 1843.

"My Dear Sir,—I lose no time in acknowledging the receipt of your letter of the 20th ultimo, and the first number of the Quarterly Issue of the Transactions of the Agri-Horticultural Society of Western India. I shall

have the pleasure of submitting the letter and number to the society at our next general meeting on the 10th instant.

" In reply to the second paragraph of your letter, I would mention, that this society has anticipated your request for an exchange of publications. On the 3d of March I forwarded to your address the first number of the 2d volume of the Journal of the Agri-Horticultural Society of India, which was followed by the second number on the 31st idem. I hope you have received both these numbers; they were sent by *banghy* to make the postage lighter. I will not fail to send you the succeeding numbers, as published; but I regret to add, that the society is obliged to send them *bearing postage*, in consequence of the withdrawal of the Government frank.

" Should your association be desirous of possessing the numbers composing the *first* volume of the journal of this society, I shall be glad to forward them.

" I am, dear Sir, yours, faithfully,
" James Hume, *Honorary Secretary.*"

George Buist, Esq. *Secretary,*
Agri-Horticultural Society of Western India, Bombay.

" Agra, *May 1st*, 1843.

" Sir,—I had the pleasure of receiving yesterday your letter, accompanied by the first number of the Quarterly Issue of the Transactions of the Agri-Horticultural Society of Western India, and beg to return you the thanks of our Society for them. We shall have great pleasure in forwarding to you any of our reports, &c., which we think may be either interesting or useful; in the meantime, we shall feel obliged by any assistance you can render to our young Society, especially in the transmission of any seeds that may be rare in India, and a few mango seeds, of good varieties, would be much esteemed, and I think would survive so short a dawk trip. The vine seems to thrive here very well, and I should like much to procure a few cuttings of superior kinds. Government have granted us a very good piece of ground on the banks of the Jumna, from which we can procure, with the greatest ease, a supply of water to any extent. The generality of the wells here contain very brackish and hard water, which is injurious to the greater number of plants, whereas the water from the Jumna is soft, and being tempered by the sun, does not occasion the sudden shock to plants that the water from wells does. I mention this particularly, as there are three very pretty gardens here already, kept up by Government at considerable expense, two of which are watered from wells; and it would at first sight appear to be unnecessary to establish another garden here, but our object is to try experiments in Central India, to endeavour to introduce to the plains, and Europe, many of the plants inhabiting the Himalays, which are so close to us, to improve the fruits which here are of bad varieties, and to have some established institution, where any person can send any seeds or plants of value, with a certainty of having attention paid to their cultivation. We have met with very general support, and the Governor-General has kindly consented to become the Patron of our Society, and we have no doubt that we shall receive every assistance from him, when he sees that we are able to effect any good to the country about us, and its inhabitants. I am in hopes of obtaining the services of an excellent English gardener, on very favourable terms, and one of the American cotton planters is located within

a few yards of the garden, and is one of our most active members, so that I sincerely hope our Society will thrive, and prove a valuable institution for that wide portion of India included in the term of N. W. Provinces. Our high latitude, and great cold for four months, enables us to grow with much ease many plants that can scarcely live in Southern India,—including many of our favorite English flowers. Our fruits are bad in general; the loquat thrives better than I ever saw it before; and my experience in Indian gardening now extends from the southernmost part of Madras to the banks of the Sutlej. The soil of the garden is all that could be wished for,—a good sandy loam of considerable depth, resting on a well drained substratum.—I have the honour to be, Sir, Your obedt. Servant,

"WILLIAM MUNRO,
Lieut. and Adjt. H.M. 39th Foot;
Secretary Agri.-Horti. Society, N. W. Provinces."

To the Secretary of the Agri.-Horti. Society,
Western India, Bombay.

A letter to a similar effect had also been received from the Secretary of the late Mussoorie Society, now unhappily extinct.

A letter had also been received from the Rev. Mr Allan of the American Mission Press, tendering to the Society a present of three barrels of gypsum, for the purposes of experiment as a manure.

A letter had been received from Mr Vaupell, making tender of a considerable quantity of flax seed, and numerous European agricultural implements, on which the meeting would give their opinion. The following extract from a communication addressed to Mr Vaupell, accompanying his letter to the Society contains particulars:—

"You said you should like to try flax on Salsette,—now I write you this to tell you, there is shipped for me on board the *Sophia*, Captain Johns, half a ton of flax seed in two casks,—I enclose you an order to relieve it from Frith & Co., and, I pray you, help yourself to any quantity you like.—My brothers in England have been rather premature in sending out so large a quantity, as I have a stock at Manuntoddy. Do you think it could be disposed of at Bombay? If so, I should be glad if you would get rid of the half ton, after helping yourself as largely as you desire. The cost of the flax is £16; I should think it would fetch that sum in Bombay.

"We have brought out with us many agricultural implements which we have no use for, particularly ploughs, which cannot be used in the hilly country about Manuntoddy. The East India Company have sent out to Coimbatore, and other places, 400 ploughs similar to ours, which are of American construction. If, as I believe, the Company are cultivating cotton in the Deccan, they would be found useful: please to let me know whether you think there is a chance of getting rid of them by tendering them to Government. We have also a horse hoe, an admirable instrument for cleaning land, its cost is only £3 10*s.*; and a *drilling* machine for sowing, very complete, cost £10. There are ten American ploughs, with 66 spare shares, £42; and lastly, a most complete carpenter's and blacksmith's tool chest, with contents too numerous to enumerate in the limits of this letter, cost £25.—The proper season to sow flax in India is near the termination of the rains, it should be sown very thick, broad cast; if sown

thin, the plant is allowed room to throw out the lateral branches which destroy the fibre; half a maund of seed to the beega is about the quantity; the flax is ripe when the bottom of the stalk becomes yellow; deep and friable loams and alluvial soils are best adapted for the flax, but it will grow in any soil; the influence of the soil shews itself more in the quality of the fibre than in the quantity produced."

A letter from Mr A. N. Shaw, with seeds of the laburnam, &c., was laid before the Meeting, by Mr Spens.

A large parcel of seeds, brought by the Abyssinian Mission from Shoa, were, by direction of Government, presented, with a letter from Mr Secretary Willoughby. The following is a list of the seeds:—

Bakkela vicia Taba, Janaf Rolo Geos, Guaia, Tegur Asmud, Missur Dhal, Tegur Sindi, Neitch Asmud, Neitch Geps, Neitch *Sindi*, Neitch Shongor, Dumbelan Coriander seed, Attur Peas, Mashila *Wogari*, Damash Geps, Mauge Gebs, Gunren Cabbage, Sanafitch Mustard (wild), Ahia *Endott* Phytoliacca, Tubers of the "Gloriosa," Ishogoes Sendi, Galla Geps, Suf Safflor, Gondar Adunguari, Maryam ser Geps (Mary's Grass), Adunguari Small Beans, Alia Ambe, Tegur Tef, Mar Mashila Mays, Yamed Dashed Wogari, Mashila Neitch Korondjo, Shytolaccca Abysinica Endott, Adunjuari Small Beans, Mashila Giech Kadado, Abesh, Talbah Linseed, Coffee.

Geps—Litch Alkuso, Tomara Feign, Feras Gams.
Geps—Gaudieutr Workye,
Marixa Tef.
Makmako Root, for adulterating Butter.
Geps—La Barya Setlat, Andera Damash.
Geps—Geddemi, Maryam Ser, Damask.
Geps—Malatye, Sandarash, Asama Gadel.
Mashila—Shaskina Korondjo, Geich Korondjo.
Mashila—Goshami Sengada, Dengesh Sengada.
Mashila—Shiffen, Sheddari.
Mashila—Amod, Wogari, Galla.
Mashila—Effailush Wogari, Sjomi Wogari.
Mashila—Tsharaget, Neitch Sholic.
Mashila—Entchebilli Sengada, Sengada (Red), Gondari Sengadi.
Mashila—Geich Wogari, Berille Wogari.
Mashila—Yedshu.
Mashila—Gumuhel Korondjo.
Mashila—Ishapati Wogari, Neitch Wogari.
Mashila—Wundshu, Koting, Worketa.
Mashila—Geich Dyeddari, Tegureta, Neitch Diddari.
Sindi—Adusal, Neitch Shamat, Gashami (Galla).
Sindi—Zu Abun Eggar, Neitch Sellel Amhar, Asasi Amhar.
Sindi—Taberi Mangada, K'Alais Amhar, Tegur.
Sindi—Mandsi (Galla), Tegur Shamat (Galla), Kinkinna.
Sindi—Cibo, Amari (Anchar), Ain Work Amhar.
Sindi—Dimalo, Mena (Amhans), Tagosh Gumbar.
Sindi—Alebut, Siesee, Daheri, Djaraba, Marid.

LIST OF SEEDS CULTIVATED IN ABYSSINIA.

Bags.	Names of Seeds.	Amol.
1	Adunguari Small Beans (Phaseolus)	1
1	Goudar Adunguari	1
1	Bakela Bean (Vicia Faba)	1
1	Attur Pea (Pisum Sativum)	1
1	Missur	1
1	Abesh	1
1	Guaia	1
1	Nug Poymnia Abyssinica (Theel)	1
1	Suf Safflor (Carthamus Tinctorius)	0
1	Tulbah (Linum Usitatissimum)	1
1	Neitch Asmud (White Asmud)	1
1	Tegur Asmud (Black Asmud)	1
1	Dumbelan (Coriander Seed)	1
1	Gumen (Cow Cabbage)	1
1	Endott Arab (Phytolacca Abyssin.)	1
1	" Ahia (Donkey's Endott)	1
1	Sanafitch (Mustard) Sinapis Nigra	1
2	Enkoke Purgative Berry	2
1	Katshamo ditto	1
1	Geshe Fruit (Rhamnus)	1
20	Det Cotton	0
1	Coffee Maitsha Bun, from Enarea	0
1	" Churchur, from the Ittoo Galla	0
1	Shongord (Onion) Bulb	0

CEREALIA ABYSSINICA.

GRAIN CULTIVATED IN ABYSSINIA.

OF THE CROP IN AUTUMN 1842.

TEF POA.

2	Tegur Tef (Black Tef) Poa Abyssinica	2
1	Neitch Tef (White Tef)	1
1	Dagusa, the only grain used by the Emperor of Goudar	0

SINDI WHEAT TRITICUM.

1	Tegur Sindi, Black	1
1	Neitch Sindi, White	1
1	Eibo	
1	Goshami	
1	Hurkinna	
1	Marsi	Of Godjam Gala, sorts in the ears 0
1	Tegur Shamat	
1	Neitch Shamat	
1	Sendi Mena	0
1	Neitch Sellel	0

Bags.	Names of Seeds.		Amol.
1	Kalassi		
1	Asasi		
1	Amari (Red Wheat)		
1	Ain Work (Goldeneye)		
1	Adusal		
1	Za Abun Eggal		
1	Za Beri Mangada (Bullock's Molar Tooth)	Amhara sorts in the ears.	0
1	Za Gosh Gumbar (Buffaloe's Forehead)		
1	Dimalo		
1	Daheri		
1	Djaraba		
1	Abebut		
1	Siesee		
1	Marid		

GEPS BARLEY HORDEUM.

1	Mange Geps	0
1	Maryam Ser (Mary' Grass)	0
1	Galla (Galla Barley)	0
1	Feras Gama (Horse Food)	0
1	Gandiet	0
1	Malatye	0
1	Litch Alkuse (Children's)	0
1	Sandarash (Amber Colored)	0
1	Workye (Gold Colored)	0
1	Asama Gadel	0
1	Barya Sattal (Slave's Portion)	0
1	Neitch (White)	0
1	Sanaf Rolo	0
1	Tomaradeign	0
1	Damash	0
1	Godderni (of Gid-in)	0
1	Mar Mashila (Stoney Mashila or Juwarre) ...	0

TEA MAYS.

1	Mashila Juwarre Holcus Sorghum	0

Red Sorts.—Sengada, Sengada Dengesh, Sengada Eutchibilli, Goshami Sengada, Gondari Sengada, Geich Kadado, Geich Korondjo, Tegureta, Yedshu, Wunshu, Koling, Geich Djeddari, Mali.

White Sorts.—Tsharagit, Neitch Wogari, Berille Wogari, Geich Wogari, Djouri Wogari, Amod Wogari, Effailush Wogari, Neitch Sholie, Neitch Korondjo, Gumihel Korondjo, Shashinka Korondjo.

The following letter had been received from Mr Law, Tannah:—

"My Dear Sir,—I have the pleasure to forward for the Garden of the Horticultural Society, a fine variety of seeds, which I obtained from the Cavaliere Zenore, director of the Botanic Garden at Naples, who wishes to have seeds from India in return. They include some interesting and useful species, as Chamærops, Humilis, Bronssonetia, Papyrifera, Psidium, Cattleyanum, Persea, Dulcis, Cassarina Stricta, Cistus Ladamferus, Poly-

gonium, Tinctorium, Cithareseytum, Goadraujulare, &c. &c. I should wish to have a portion of them sent to the Botanic Garden at Poonah, especially such as are likely to succeed best in the Deccan. I have also the pleasure to send a box containing nine species of Cactus, likely to be new here, and also from the Botanic Garden at Naples. I had intended to do myself the pleasure of calling on you with these seeds, and to have been present at the meeting of the Society ; but cannot now do either, having been suddenly appointed to take charge of the Tannah Collectorate, where I am going immediately.

Yours, very truly,

Hope Hall Hotel, Mazagon,
24th May, 1843.

J. S. LAW."

Captain Reddie, of the *Castle Huntly*, had forwarded a large supply of seeds from Batavia, expressing a wish that his friends who might desire them should be supplied with such of them as the Society could spare. Captain Reddie had kindly offered to become the medium of communication betwixt the Bombay Society and such of the gardens of the Eastern Seas as he might visit in the course of his voyages. He had been furnished with a collection of plants and seeds on his departure from Bombay, and had promised to bring others from Singapore, Batavia, or Manilla in return.

Government had kindly granted permission to have dies cut at the Mint for the Society's Medals; and these were at present in the hands of Captain Turner.

Letter received from Dr Gibson, accompanied by specimens of Archill (Roccla Tinctoria) from Mozambique, which he considers similar to the true Canary Archill. By the usual tests Dr Gibson found it yield a colour rather inferior to that of the Canary Archill, and judging from the price of the latter, he considers that the probable value of this may be about £45. Dr Gibson suggests that it may be important to ascertain to what distance up the Eastern coast of Africa the lichen is found, as it is scarcely probable that it is confined to the Mozambique itself. In relation to this communication the following have been received:—

Observations minuted by Major Jacob and Mr Spens.

February 20th.—" I shall be happy to further the inquiry respecting the Mozambique Archill, if the Committee wishes it, by taking with me to Aden a specimen of it, and interesting Captain Haines—the political agent—in the subject. Native vessels and cruizers come to Aden constantly from the Zanzibar settlements, and the best information can be thus had respecting the whole line of coast up to Cape Guard, Africa. In this, or in any other branch of inquiry, if I can be useful whilst at Aden, I shall be most happy to be commanded.

" W. JACOB."

February 21st.—" Archill, or Archella, has, I believe, been well known to the Zanzibar merchants for many years. I have not been able to ascertain whether any quantity has found its way to this port; but, about two years ago, a Mr Cardone sent a specimen from the Mozambique, and offered to supply any quantity from thence,—stating that he had sent a shipment from Angola, on the western coast of Africa, which had sold for Rs. 145 per cwt., or nearly £300 per ton. Mr M'Culloch, in his Dictionary, states that the

Canary Archill sold, in 1834, in the London Market, for £320 per ton, whilst the worst from Barbary only fetched from £10 to £25. It would no doubt be a valuable dye to the natives of India. It yields a very rich purple, and, though not a lasting colour, would answer well for turbans, &c.

"A. SPENS."

The following letter had been received from Dr Gibson, accompanied by specimens of the sugar described :—

To DR G. BUIST, *General Secretary Agri.-Horticultural Society.*

"SIR,—As the Meeting notified for the month of May was, I understood, fixed to take place on the 20th, and as it was stated that at the said Meeting a Cart and Bullock Prize would be given to the producer of the best Sugar, I beg to send the bearer Bala Benbra, carrying with him two specimens of his own manufacture.

"He learned the art last season, and practised it this season on the farms of two men in this vicinity.

The total quantity he manufactured amounts, by my estimate, to about (lbs. 3200) three thousand two hundred pounds, but as one of the men had not yet broken out his stock, the exact quantity cannot yet be ascertained; but the above estimate will be found near the mark.

"The Society will doubtless notice the great difference in grain between No. 1 and No. 2: This is caused not by any difference in the mode of manufacture, but by the nature of the soil and the exuberant application of manure to the canes of No. 1. This, I have remarked, has, when applied in excess, always the effect of giving a soft grained sugar. Both specimens are made by *one* process, and with the simple machinery; no clay nor other adventitious substance has been used, excepting the usual dose of lime in the boiling. I have the honour to be, Sir, your most obedient servant,

"ALEXANDER GIBSON,
Secy. Bot. Gardens."

"*Govt. Garden, Hewra, May* 13, 1843."

The following changes had taken place in the arrangements of the Committee, as agreed upon by Special General Meeting of the 2d April, and now wanted confirmation of present Meeting :—

P. W. LeGeyt, Esq.; A. Spens, Esq.; Cursetjee Jamsetjee, Esq.; Drs Giraud and Buist, *Secretaries.*

Colonel Moore, R. W. Crawford, Esq. and H. B. E. Frere, were elected Members of the General Committee, in room of Dr Alex. Duncan, Dr R. H. Kennedy, and Robert Mackim, Esq.

H. J. Gordon, Esq., and R. W. Crawford, Esq. were elected Members of the Garden Committee, in the room of Dr Kennedy and A. C. Maclean, Esq., about to leave for England on the 1st May.

In the Committee of Government Prizes, in the room of John Skinner, Esq. who had left the Presidency, and Dr Kennedy, who was about to leave, A. Spens, Esq., and Joseph Henry Jackson, Esq., Collector of Continental Customs, Surat.

Since last General Meeting, Thomas Ogilvie, Esq., C. S. had been admitted member of the Society, and Lieut.-Colonel Hughes was now proposed by the Chairman, and elected unanimously.

The first point for the consideration of the Society was the arrangements required for the superintendence of the gardens. The Chairman was decidedly of opinion that the Society ought not to be discouraged by the failure of the late experiment: there was no doubt that a gardener such as was desired might be obtained by the Society on the terms proposed; and he recommended that the arrangement of details should be referred to the Garden Committee. This recommendation was adopted. There were three applicants for the appointment, of whom, all circumstances considered, Mr Proctor appeared to be the most eligible, as the employment would be of a temporary nature—terminating with the arrival of a gardener from home. It was recommended that the engagement should be made for a definite period of not less than five years, with an increasing salary; terminable, at the same time, at the option of the gardener on giving six months' warning, and reimbursing the Society for any extra charges they might have incurred on the assumption of his remaining for the above period in their service. The details of the arrangements were referred to the Garden Committee, to be carried into effect and reported on next general meeting.

Dr. Giraud reported that the ticketing of the plants with labels containing the scientific name and classification, as well as that by which they were generally known, was in progress. The tickets were of thin drawing paper, printed, and varnished with copal, and were found well suited to withstand the rain. A dozen or two of each would be printed off for the use of members or of those who obtained plants from the gardens.

On the recommendation of the chairman, it was agreed that lists of such plants and seeds as the Society had to dispose of should be printed for gratis distribution.

The seeds formerly ordered from Scotland were expected to have arrived by last mail, but had not made their appearance; they might, it was hoped, be depended on by that looked for about the 10th of June. Orders had already been sent in almost sufficient to clear the hands of the Society of a considerable proportion of the seeds just expected.

Mr. Anderson recommended that an application should be sent into Government, with a view of making some abatement in the charges of seeds sent overland, which he felt assured would, in so far as a remedy lay within their reach, be attended to. It was explained that at present Messrs. Waghorn and Co. charged for goods at the rate of 4s. per lb., and that this included all costs from home; that this would fall heavy on the larger kinds of seeds only. The charge of Government for goods as per tariff of 1838, still in force, was—for parcels not exceeding 400 cubic inches, or 1 foot in length and six inches in breadth and depth, Rs. 6; for those under 1000 cubic inches, or 1 foot by 9 inches, Rs. 7, and so on; the charge diminishing with the size of the parcel. It was hoped that very great improvements would speedily be effected in the transmission of goods to and from England overland, both in point of cheapness and facility of despatch. The question was remitted to the committee for consideration.

In reference to the letter of Dr. Gibson in regard to the sample of sugar claiming a prize, now produced, it was agreed that as the notification now found recorded in the Minutes, to the effect that a bullock prize should be given in the month of May, might have led to the present misconception, and as the present sample had been produced on the faith of this, it was expedient, though no prizes had been advertised, if the spirit of the conditions usually annexed to the award of prizes had been complied with,

that the prize claimed by Dr Gibson should now be given. The matter was remitted to the Garden Committee, who were authorized to give a prize of Rs. 150, or the equivalent of a garee and bullocks, to Bala Benbra, for the production of 3200 lbs. of sugar, or to have them purchased for him.

On consideration of the letter of Mr Vaupell with inclosure, it was agreed, that as the Society had itself no occasion for the seeds or implements referred to, and had no means of insuring their sale to others, the state of their funds did not warrant them in making the purchase.

The proposition to continue surrounding the garden with wire fence so far as the stock now on hand extended, was approved of. The plan of two sets of double fan-wire gates for the admission of carriages to the terrace, was sanctioned, and directed to be carried out by the Garden Committee, provided the funds of the Society were considered to be in such a state as to permit of the expense being incurred.

Large additions were directed to be made to the mangoe nursery, in which at present there were only 70 grafted plants fit for being put out,—500 seedlings were desired to be raised annually and grafted as soon as ready; the demand for grafted plants being very extensive. Great attention was desired to be paid to the collection and arrangement of native seeds for sale; these were in much request for foreign parts,—parcels had lately been sent to Scinde, Aden, Egypt, Malta, Singapore, China, and Batavia; and requests for supplies had been received from various parts of England and Scotland,—from Naples, and other quarters.

A letter had been received from Mr Douglas, Secretary to the Ceylon *Agricultural Society*, acknowledging the receipt of 20 copies of the Society's regulations, which had been sent to them, and intimating that they had been distributed.

From Dr J. G. Macolmson, Secretary to the Bombay Branch of the Royal Asiatic Society, accompanied by a large parcel of silk cacoons, produced in Kattiawar. These had been sent by Dr Nicolson, Civil Surgeon, a copy of whose letter was annexed: and were now by resolution of the Asiatic Society presented to the Meeting. The following is Dr Nicolson's letter:—

"On the 10th March, 1842, I first received the eggs of the silk-worm, which I was induced to write for after observing the surprising manner in which the mulberry (tree) grew; finding that two old trees which were in my garden were decidicious in the cold season, I planted small squares with cuttings, as well as planting the same in all the water-courses. These young plants were not decidious, and yielded a continual supply of berries, being cut when about 18 inches high. On the 28th March, 1843, the silk-worm had yielded nine crops of silk, and the tenth series were half grown! From the experiment above mentioned, I am induced to think, that silk culture in Kattiawar would be as successful as in any part of the world.

(Signed) "B. A. R. Nicolson,
Civil Surgeon, Kattiawar."

The Committee were directed to arrange for the distribution of prizes at the next Meeting,—due intimation to be given of the number and value of the prizes and the conditions of competition. It was recommended, that special attention should be paid to the promotion of the cultivation of mar-

ket vegetables, and the advancement of the interests of the market gardener. The mere remuneration of gentlemen's mallies was matter of almost no consideration: it was the promotion of the remunerative culture on the part of the natives themselves, and on a considerable scale, that the Society had in view.

Some specimens of seats and benches, which had been provided, were approved of, and a supply desired to be procured for the Gardens.

It was agreed that the next meeting should take place in the Gardens in October or November, according to the state of the weather.

The Meeting then adjourned.

Remarks upon the Common Wheel Vehicles of Western India—Some Plain Notes regarding the Principles of Draught, intended for the Use of the Natives—With attempted Improvements upon the Labour Carts in present Use among them. By Lieut. GAISFORD, of the Bombay Artillery. (*Presented for Publication by Government.*)

IN countries unprovided with roads, where the surface naturally permits the employment of wheel carriages in operations of husbandry and transport, local peculiarities have prompted the invention of vehicles, various as the districts wherein they have originated, some of them well adapted to their particular intention, but few at all suitable for general use.

We are familiar in the West of India with a great variety of these, from the simple cart on which the "Wudaree" hales stone from the quarry, having buffalo horns stuck in to form its sides, and hobbling upon wheels so eccentric as to belong sometimes as nearly to the square as the circle: the wicker baskets of the Sassoor neighbourhood, &c. rolling on two rudely rounded stones; the ponderous cart of the Deccan Koombee, with wooden axle and low solid wheels, devolved their several generations from sire to son, furrowing up the roads like a plough; next in gradation follows the Konkan garee, probably of Portuguese introduction, and nearest of all in approach to the forms we approve—the light high-wheeled, but top-heavy carts which sometimes find their way hither from the Madras districts.

Two carts, of plainly indigenous birth, are here introduced as examples of the best and worst of their kind we have met with, viz.:—

Fig. 1. The Delhi cart proved excellent, by the astonishingly good condition in which we found a number of this construction after performance of the distance from the Bengal provinces to Cabool, laden with stores. So simple and inexpensive are they, that we might re-

commend them, with the mere addition of tyers, and trifling increase of the wheels' height, as possessing every quality desirable in the circumstances of this country.

The only iron in their whole frame is that used to bolt the transoms to the side beams, and two pins for axes, with nave bushes: the outside bearing upon these pins gives all needful strength, while the small diameter of the axle reduces its friction to a very trifle. Three bullocks are usually driven in these carts "Unicorn;" an upset (and accidents were frequent) appeared to cause little harm; in fact no injury is likely to occur that cannot be repaired by the driver then and there.

Reserving the other particulars concerning this ingenious cart for annexation to the sketch, we now present a second example, in which, besides its unmitigated rudeness, there is nothing remarkable but that, being in very common use in Lower Scinde, the machine should never have advanced beyond the very first step in the application of a principle upon which the slightest mechanical ingenuity must impel advances.

The principal member of this primitive invention is a crooked branch A, forming at once the pole and one side of the body. Another branch B, with five tranverse sticks, completes it. Two pegs on each side-beam confine the axle, which is of wood, revolving with the pair of wheels, and creaking vilely.

Of the Guzerat carts it may be said, with those described on pp. 19 and 20, that they are excellently suited for their purposes; our present business, however, is with carts intended to travel on made roads, which reduce the thoroughfares of a country so nearly to an uniform solidity and level, that a single good model is all we need to seek for supplying every use wherever such artificial roads extend.

Some principal lines of traffic in this presidency, in consequence of such improvements, now encourage an extensive substitution of wheel vehicles in place of the difficult and costly transport upon pack animals: a remodelling of the unsuitable conveyances now existing for the heavy produce of the interior, and the promulgation of the experience on the subject of draught collected in countries where it has longest been used and is best understood, have, therefore, become worthy attempt, and promising of utility.

We propose, then, to consider, with special reference to the circumstances of this country, what form and dimensions of cart is preferable for adoption here—the reasons of preference, and the question how the expense of draught may be best economised, and the durability of roads prolonged.

Two interests, not usually acknowledged kindred, will thus be viewed together, for we believe it will appear in the inquiry that the advantage of the party at whose expense the highways of a country are maintained bears close relation to that of the industry trafficking upon them. At the conclusion we shall offer designs for one light and one heavy

cart—cheap and simple—culling and adopting, from every variety we have observed, well tested contrivances, and combining all to the best of our skill, for farther experience to approve, and the ingenuity of others to perfect.

In order to comprehend how animal power can be most beneficially exerted in the draught of a load upon wheels, we must examine the sources of resistance to their revolution, and these are three, viz.—

1.—Of the Road's Surface.
2.—Of Friction at the Axle.
3.—Of their own Weight.

The perfection of roads is to be even and unyielding—qualities which, in practice, none but railways possess. The resistance arising from their inequality and softness is, however, greatly reducible by giving all convenient height to our wheels, and scientific experiments have determined this reduction to be proportionate to their increasing diameter; * but to speak popularly, it is plain that, in proportion as a wheel is larger it will roll more smoothly across hollows, into which one of less diameter must descend; that it takes more time to surmount the same obstacle than one of less height; consequently, with large wheels, the cattle have to exert an effort less violent, although more prolonged, than with small ones, and this is easier to them for the same reason that makes it better to ascend a *hill* by a *gradual* than by an abrupt slope.

The injurious action of low diameters may be observed by placing pebbles before wheels, small and large, in the ordinary sense, heavily laden; by the first, if the ground is slightly compressible, the stones will be thrust *forwards* and *into* the soil, if it is solid they will be driven before the wheel or pushed aside; by the second, they will be pressed into the soft road or crushed upon the hard, without changing place—an effect much less destructive of roads, and obviously less prejudicial to draught.

Here the individual and the public interests are identical. The small wheel which displaces the materials of a road must again and again be dragged by the cattle against obstructions which the high wheel surmounts or crushes once for all. It is manifest, too, that all concussions sustained by a road must react upon the carriage to the

* The following are extracts from a report of a committee appointed to give an opinion on some Tables of Experiments presented to the Academie des Sciences by Lieutenant Merin of the French Artillery:—

"Ses experiences, en nombre de 40 mettent suffisemment en evidence cette double loi, que le tirage est proportionnel a la charge, et en raison inverse du diametre des roués.

"Le peu d'accord entre les observateurs qui out précédé M. Marin faisait desirer un travail plus exact et plus complet. Les ingenieux appareils dynanometrigues, pour lesquels l'antenr a reçu un prix de l' academie, devaient tronver ici emploi," &c.

injury of its frame and lading, the check of momentum, the discomfort and fatigue of the team.

Can a wheel, then, be too high? Yes; for weight is an important consideration, so is cost, and the strength of materials, but principally the due inclination of the line of draught should govern its diameter, for within this limit neither weight, stability, nor expense, are affected to the carriers' disadvantage, and this subject we shall return to in describing our Models of Labour Carts.

The preservation of roads and their resistance to draught depends on another quality of the wheels, namely, their width of tyre; and here again the good of the road accords with that of the draught beast and his owner. In soft ground ruts are shallower, proportionately with their breadth, but the advantage of broad tyres, whether to the road or draught, holds good to a certain extent only. Experiments have shown that even in sand the benefit ceases at the limit of about $8\frac{1}{2}$ inches. Widths, much exceeding this, have in some parts been encouraged by law, under misapprehension of their real impression on the roads, which, consisting of materials varying in size and obduracy, it results that the weight, instead of being diffused equally over the whole breadth of rut, infringes mainly upon a few prominences extravagantly wide: tyres, therefore, are merely useless aggravations of a load.

Width of tyre is advantageous only when wheels are cylindrical; if they are coned, the wider they are so much the worse for both road and cattle. (Fig. 1.)

On "Pavements" width has no influence, because, as is evident, the broadest tyre can only touch them on a few summits. This may be seen by observing from the front, a wheel as it advances towards you, or by examining the trace it leaves.

On a good "metalled road," or on the same in different order, provided the foundation is firm, width beyond 4 or $4\frac{3}{4}$ inches produces no equivalent benefit; but such is not the case on roads made of friable materials, such as "Mooroom," and the softer these are, by so much, within the limits before indicated, should the wheels be broader. Exception is of course due when the loads are not excessive, as will be noticed under the proper head.

Thus it appears that width of tyre is, on the one hand, no just scale by which to apportion decreasing highway tolls to the encouragement of overdue loads and consequent crushing of material in spite of it; neither, on the other hand, should it be neglected, for where the road is very soft the depth of rut is, as aforesaid, less in proportion to the tyre's greater width. Both considerations together have led to the conclusion that about 4 inches is the best for moderately heavy draught on ordinary roads—such wheels might carry 15 cwt. each without injuring the road, and, to sustain that weight, wheels of the above breadth need not be too heavy in draught.

The second impediment to a wheel's progress is axle-friction—an amount dependent upon the pressure of the load, upon the nature of the axle-arm and its box, and upon the wheel's fitness or unfitness of form to roll naturally in a right line.

Friction arising from pressure (except of extremely heavy weights) is, on the same axles, with equal loads constantly the same and proportioned to the load's increase or diminution—that arising from the grinding of the axle arm in its box varies very considerably with the different materials—of these iron is the best, and with such well made and well lubricated axle friction amounts to about 1-8th of the pressure—a quantity again diminished by the leverage of the wheel's radius.

It is common to suppose that axle friction is lessened by diminishing the contiguous surfaces of the box and axle. Under this impression some have proposed polygonal boxes, and others will tell you that a wheel runs lighter with bushes at each end of the nave than with entire boxes; in fact, however, these motions are merely fanciful, the friction in all is the same if all are equally well made; but it does not long remain so, for, of the above contrivances, the first would soon wear loose; and the second, which is the common usage of this country, prematurely destroys the axle, both effects being prejudicial to draught, from the wabbling of the wheel in the one case, and the cutting and grinding of the bushes in the other. The boxes recommended in the models following are made with plate iron—cost no more than the bushes above mentioned as destructive of both nave and axle, and we have proved the substitution good.

The same expedient whereby the road's resistence is better overcome reduces the resistance at the axle also—namely, giving the wheel the largest diameter admissible—because the leverage of the wheel's radius, as compared with the radius of the axle, affords a purchase constantly increasing in direct proportion to its length.

Axle friction is influenced, moreover by the form of wheels independently of their size.

An undished wheel revolving on a straight axle arm follows naturally in a right line, creating no avoidable friction. Such a wheel is the cheapest to make, the easiest in draught, and the least hurtful to a road.

But with vehicles of heavy burden this construction wants strength to resist the lateral shocks constantly occurring on bad roads; hence the practice of dishing and inclining the wheels.

This construction produces no noticeable injury to the roads with light carriages, while it introduces the following valuable qualities:—

1st, Strength, combined with lightness, and a certain degree of elasticity in the wheel, to elude the rapid shocks of quick draaught.

2d, Aptitude for running on a bent axle, still presenting the spokes perpendicularly to the weight, while the inclination an axle so bent gives

to the wheel; casts the mud and dust of the road clear of the carriage, and allows a copious supply of oil for lubrication of the axle, to rest in a reservoir at the depressed end of the nave. This construction is also said to allow of expansion and contraction in the wheel; but the fibres both of spokes and felloes run longitudinally; in which direction wood is not liable to swell or shrink.

A certain amount of axle-friction is created by the tendency a wheel thus inclined has to fly from off the axle in a circular path, the centre whereof is at the point where the axle-arm, prolonged, would strike the ground. This amount, however, with a wheel of dish no greater than is due, to attain the advantages above described, is very trivial, and partly counteracted by another tendency natural to the same form of axle, viz., that of constantly *sliding up to the collar* at the axle-shoulder. The inclination has yet another advantage, it *balances the wheel*, which will not, like a straight one, stand in equilibrium vertically; and farther, when the wheel descends into a hollow, the main shock falls at *a*, where the axle is strongest. (*vide* Fig. 4.)

But the case is different with heavy vehicles, in such avoidance of dust and splashes is no desideratum, for the pace is not fast enough to cast them up, neither is there inducement for thus securing a supply of oil, for lubrication is well enough effected in a ruder manner; the necessity for strength, however, remains, and must be provided for.

It has already been affirmed, that neither those who use a road, nor those who maintain it in repair, can profit by thwarting one another: the injury both suffer when this attempt is made, is well illustrated in the instance of the Road Waggon,—no longer common on English roads, but deserving rememberance for examples of the truth of our affirmation,

These waggons (full accounts of which are given in the U. K. Society's Treatise on Draught, p. 438) carry upwards of a ton on each wheel. Now, if the entire bed of the road were of similar consistence, $8\frac{1}{2}$ inches tyre would, according to experiments carefully made, run easiest in draught, but the carrier prefers a width of three or four inches—firstly, because wheels of that dimension are lighter and cheaper, and because they arrive at the solid bottom of the road without having to displace and drive before them so much of its loose upper coating. Bad roads abounding in deep ruts and hollows oblige him to dish, his wheels i. e., insert the spokes obliquely into the nave (Fig. 3)—the advantage of presenting the spokes perpendicularly to the weight makes it at the same time necessary to give them a corresponding set off, (as in Fig. 4) by bending down the axle arm the tyre, it will be observed, no longer presses evenly on the ground, and the road-makers, discovering that the enormous pressure bearing on so narrow a surface cuts up the road and crushes the stones to powder, compel the carrier, by prohibition-tolls, to widen the tyre three or four fold, and to make them press flatly on the ground. From the necessity of providing,

stiffness to withstand the lateral shocks he is unable to dispense with the "dishing;" but, if retaining that, he seeks to comply with the regulation as to width and flat bearing, by placing his dished wheel on a straight axle, (fig. 2,) he sacrifices its strength for resisting vertical pressure, the angle at which the spokes spring from the nave becomes only so much leverage (e. d. Fig. 2) for aggravating axle friction, and straining their joints—the wheel, from its preponderance on one side, bears heavily inwards—the consequent unequal friction at the upper surface at the axle shoulder, and under surface at the linch, wears away the end of the bush—the wheel falls gradually more and more inwards—the grating and straining become worse, and wheel and axle are prematurely worn out.

Reduced by an absurd law to a choice of evils, he adopts conical wheels of enormous weight, and compels them, in contravention of their natural property, to follow the same straight path as if they were cylindrical, thus obeying indeed the letter of the law, but at the detrimental expense of two or three horses' power for the extra draught of a machine which grinds the roads to mortar.

Conservation of a road merely demands the use of wheels proportioned in breadth to the load they carry, perfectly cylindrical, to cause no grinding of material, and of the largest convenient diameter, that displacement of the surface of the road may as much as possible be avoided.

Economy of draught requires the same properties, but combined with others, irreconcileable with the foregoing, according to the ordinary construction of heavy vehicles, although of easy attainment. They are possessed by Jones's Patent Iron Wheels, now extensively used in England, and in those of the second of the two patterns, which we now proceed to describe.

No. 1.—*Light Labour Cart.*

This cart is calculated to carry from half a ton to 12 cwt., and accommodated to the height of the common bullocks of the Konkun and Deccan, one pair of which is equal to draw such a burden on ordinary roads.

It will not exceed the cost of a well constructed Konkunee cart (Rupees 40 to 50 at most) and we have endeavoured to give to it certain desirable qualities wanting in the latter, and best exhibited by opposing to them the defects we object to.

Objections to the Konkunee Cart.	Obviations of these in Model.
I.—Line of draught too oblique, thereby making the animals lift instead of draw, more than is expedient, unless the cattle are very muscular, and the loads very bad.	Line of traction better accommodated to the size and powers of the cattle wheels; more favourable both to the roads and the draft.

II.—Connection between load and wheels broken bythe loose method of fixing the body to the axle, and interposition of two or three blocks between them, allowing of play and consequent waste of momentum.	These parts rigidly connected, simplified, lightened, and greatly strengthened.
III.—Frame clumsy and weak, and altogether a piece of bad carpentry.	Greater strength obtained with less material; any part that may break is readily removable without dismemberment of the rest.
IV.—Bushes of the nave consist of two rims of iron, which, having little hold of the wood, are apt to get loose and destroy both nave and axle for want of more extended bearing on each.	Boxes made of iron plate, running entirely through the nave,—a contrivance not dearer, more durable, better for lubrication, and causing less attrition of the axle.

Linchpins of improved form are introduced, after a pattern we admired in Tuscany for its effectiveness and simplicity—nothing but the human hand is likely to remove it; a simple and effectual friction drag is also appended, a contrivance destructive neither of wheels nor of roads.

No. 2.—Heavy Labour Cart.

For conveyance of cotton, salt, and heavy merchandise along the roads of the interior, economy of wear and tear, and of human labour, recommend carts of larger capacity, drawn by longer teams than would be convenient in the narrow and crowded wharfs and streets of Bombay.

No. 2 is proposed for these purposes, and proportioned to carry one ton and a half, to be drawn by six bullocks, yoked three abreast,—a mode which, however it may savour here of innovation, is the common and accustomed way of harnessing in Europe, and has approved itself to us, after extended and careful observation, as particularly advisable for introduction here.

It is indispensable to our profit and success in competing with other countries for the supply of bulky produce, to seize on every means of cheapening its production. A commodity fetches its price in the market, come it whence it may; and every farthing we can rescue from outlay on its transport thither, is so much gained, or so much left available for disabling competition in other quarters, and so extending our own vent.

The main staples of Bombay are largely derived from far inland by costly modes of import. The cart here proposed is calculated to reduce this expense: *firstly*,—in human labour, for one man can perfectly well drive six bullocks thus harnessed; *secondly*,—in animal power, for the line of draught is most favourable, or, in better understood terms, the traces have a proper inclination, and the cattle are "close to their work." It must not be objected that such a team engrosses too much of the road, for after all, it requires no more frontage than many carts do.

Furthermore, the shafts are sustained by three bullocks instead of two, and the beasts draw from two fixed points, instead of one unsteady one.

A simple and portable windlass, universally used in southern Europe, is added as an appropriate implement for binding cotton bales, hay, &c. A friction drag is applied to both wheels for the descent of ghauts with full loads, and we adopt wheels of the construction known as Surat wheels, and highly approved of in the "Treatise on Draught," p. 442, observing in their dimensions the principles we have endeavoured in this humble essay to explain and recommend.

P.S.—The plans and elevations accompanying this paper are imperfect. No 2 is represented with light wheels and axle. The up-country carts come to Bombay laden for the most part with light bulky loads, and return with salt, iron, &c. For heavy loads *both ways*, six bullocks and heavy wheels would be most suitable. For light loads down and heavy loads up the cart should be made somewhat lighter, and the light wheels and axle not be loaded beyond 15 or 18 cwt., for which three bullocks would be sufficient in either direction.

(Signed) THOMAS GAISFORD, *Lieut. Artillery.*

(True Copy) L. R. REID, *Chief Secy. to Govt.*

Bombay, 25th April, 1843.

HORIZONTAL WIRE FENCES.

I AM not aware of how long it may be since the elegant species of park enclosure, known by the name of the Horizontal Wire Fence, first came into general use in England, nor to what particular party we are indebted for its introduction. Over many of the southern and central counties it has been most extensively employed for a period of about twenty years, and found equally remarkable for its elegance, economy, strength, and durability. It was, I believe, first introduced into the midland parts of Scotland, by the late Sir Alexander Muir Mackenzie, of Delvine, about the year 1833:* he substituted wooden uprights for iron ones; and in the course of a few years, had no less than fifteen

* The following account of the expense of the construction of wire fences in Perthshire, was forwarded by Sir A. M. Mackenzie to the present writer, then Editor of the *Scottish Agricultural Magazine*. This periodical has been

miles of wire fence set up on his estate. It subsequently came into very general favour, chiefly as a fence for parks and pleasure grounds long since discontinued, and is now out of print. Sir Alexander's statement will give the results of actual experiment in Perthshire :—

To the Editor of the Scottish Agricultural Magazine.

SIR,—I shall be very glad if the following hints for fences made of iron wire shall be found useful to any of your readers.

I am, Sir, your most obdt. servt.,

DELVINE, January 26th, 1835. A. MUIR MACKENZIE.

HAVING learned that, in some places in England, fences constructed of iron wire had been adopted, it occurred to me that inclosures of that description, under certain modifications, might be used with advantage in some parts of this country where fences of other sorts might be troublesome and expensive. I therefore transmit to you the result of some experiments which I made on the matter.

These fences may be considered as consisting of three principal parts—First the wire; second, the posts between which the wires are strained; and third, intermediate posts, the purpose of which is almost exclusively to prevent the separation of the wires from each other, when any animal attempts to pass between them. The wire must be of the best and softest quality, and formed by rolling, as that which is drawn is too brittle. I have been supplied with the wire partly by Messrs Redpath and Brown, Edinburgh, and partly by Mr. Young, George's Street, Perth.

I have found, that in a fence consisting of five wires, the uppermost of which shall be 3½ feet from the ground—the wire denominated No. 8, being three sixteenths of an inch in diameter, and costing three farthings per yard, is of quite sufficient strength; the straining posts must be from 6 to 9 inches in diameter, and 7½ feet in length, furnished at the bottom with a sole, of such length that a stay fixed at its outermost extremity, and carried to about 3½ feet from the bottom of the post, shall form such an angle as to give adequate resistance to the strain applied. The intermediate posts will be of sufficient strength if made four inches in breadth, and 2½ inches in thickness, and driven about 18 or 20 inches into the ground. With regard to both sorts of posts such portions of them as shall be under ground, and perhaps 2 or 3 inches more, must be carefully charred. The distance at which the straining posts must be placed from each other will be regulated by circumstances. When the surface of the ground is smooth, and when the direction of the fence is a straight line, they may be placed at a distance of 100 yards from each other; but when the surface is irregular, or when the direction of the fence is curved or angular, they must of course be situated much nearer. The intermediate ones may be placed at a distance of 3 yards from each other.

The wire—which is furnished in coils—being first rendered straight by being drawn through iron pegs, fixed in a flat board, must be put through holes made in the intermediate posts, or fixed with iron hooks driven into their sides.*

One extremity of the wire being put through holes made in one of the straining posts, and wound about half round the post, and fixed with iron staples or other adequate means; the other extremity of the wire is then put through similar holes in the opposite straining post, and the requisite degree of tension given by means of a screw, made upon the principle of the old Irish corkscrew. When the requisite degree of tension is given, the strain is retained by means of what is called a collar vice, which holds the wire firm till the end can be fixed, as described above; it will be advantageous, when this

* Unless where there is a view of removing the fence, I should prefer the holes.

in all parts of the county. Mr. Oliphant of Condie, late M.P. for Perth, first resorted to it for the enclosure of the poor hill pastures of

is done, to return to the first post, and stretch the wire in that direction also, so as, as much as possible, to equalise the strain on the whole wire; while giving the strain, it will be necessary, from time to time, to adjust the intermediate posts, which will be drawn off the perpendicular by means of the friction; and it may be proper to drive each of them a little farther into the ground. These operations will be repeated till the whole length of fence proposed is completed.

The whole is then covered, wire and all, with a mixture of common tar and coal varnish, in the proportion of two of coal varnish to one of tar, laid on hot, and very carefully, with a painter's brush. Care must be taken not to overboil the mixture, as, when overboiled, the coal varnish is apt to harden and scale off. To carry on this process, there must be a portable furnace, that the mixture may be kept hot.

The different pieces of wire are joined together as in bell-hanging.

It is of some importance to attend to the temperature of the weather when the wire is strained. If it be extremely cold, the wire will expand during the summer heat, and get too loose; and if it be very warm, the risk of breaking, from the frost in winter, is considerable.

Should any persons be inclined to try this fence, I should recommend them to apply to Mr. Young at Perth, or Messrs Redpath and Brown in Edinburgh, to put up the first piece, after which any tolerably intelligent smith or labourer can do the rest.

The following is an account of the actual expense of a fence of 111½ roods, for which all the wood was purchased. In this case, the straining posts were merely round larch, with only the bark taken off, and the intermediate posts merely squared at the saw mill. I understand that Mr. Young has constructed a fence of this description, and of sufficient height and strength to confine deer—the height of the fence being 8 feet, the intermediate posts of iron, and the wire of much greater dimensions than the above, and the expense from 8s. to 9s. per rood.

LIST OF TOOLS, &c., REQUIRED IN ERECTING WIRE FENCES.

A straining screw, A Collar Vice, Two handles for ditto,	£1	12	6
Two pair of smiths' tongs,	0	5	0
Two pair of strong gloves,	0	3	0
A block of wood, and a pair of stretching eyes,	0	1	6
A file,	0	0	6
A mallet,	0	4	6
With other tools used by labourers.			
	£2	7	0

NOTE OF THE EXPENSE OF A WIRE FENCE ERECTED AT DELVINE.

Length 111½ *roods of* 6 *yards each*=669 yards.

Wire, 3345 yards of No. 8, at 0¾d per yard,	£10	9	0¾
Straining posts, 9, at 5d.	0	3	9
Intermediate do, 214, at 2½d.	2	4	7
Spurs to straining posts—also, spurs to the fence where there are curves, 12, at 2½d.	0	2	3
Hooks, 1070, at 1s. 8d. per hundred,	0	17	10
Staples, 90, at 1s. 8d. per ditto,	0	1	6
Pitch (say)	0	10	0
Fuel, &c. (say)	0	2	0

the Ochils, which are many of them so little valuable, as to be undeserving of the outlay any other variety of fence would incur.

It occurred to me on observing the enormous area required for a hedge of prickly pear, and the harbourage for every variety of filth and vermin afforded by it, that wire fences would in India become excellent substitutes for this for the enclosure of compounds: and that with still greater expediency and benefit might they take the place of the heavy, unseemly, and expensive, stone walls, and clumsy and costly railings with which the dwelling places belonging to the wealthier of our natives are usually surrounded. A considerable quantity of wire, at the desire of a friend, was accordingly ordered from home; but somehow the standards were mis-sent; and a difficulty existing as to the manufacture of these in Bombay,—probably the worst place in India to get any piece of blacksmith work out of the ordinary way executed,—the wire still remains in the godowns unused.

Meanwhile the fences of the garden of the Agricultural Society having gone to decay, and an estimate for the construction of the most inexpensive variety of stone wall that could be erected having been taken in, I suggested that, as a wire fence could be brought out from England, and set up at little more than one half the price of the wall, that this should be adopted in preference. The suggestion was agreed to, and 400 yards of fence, 4½ feet high, and consisting of 9 horizontal wires, was accordingly ordered. Of the details of this, particulars will be given by and bye: it is enough to state, that though the setting up of the fence was attended with more cost and delay than was anticipated,

5	days of a labourer dressing and charring, &c. straining and intermediate posts, at 1s. 2d. per day, ...			£0	5	10
6	days of a labourer erecting straining and intermediate posts, at 1s. 2d. per day, ...			0	7	0
6	days of a labourer straightening wire and putting it into the hooks, at 1s. 2d. per day, ...			0	7	0
6	days of a labourer stretching wire, spurring straining posts, &c. at 1s. 2d. per day, ...	£0	7	0		
2⅔	days of a smith, ditto, at 2s. 6d. per day, ...	0	6	8		
					0	13 8
6	days of a labourer pitching fence, at 1s. 2d. per day, ...			0	7	0
					2	0 6
Carriage of wood, wire, &c. (say)					0	11 0
111½ roods, ...£17 2 5¾						

3s. 0¾d. &c per rood=6d. a yard.

In remote places, a something cheaper fence may be made, by using for the intermediate posts small larch thinnings, merely sawn up the middle, and the bark taken off, and by dressing all the posts, or using iron intermediate posts, a very handsome invisible fence may be made.

it has realized the expectations of the Society: and excited from its appearance the admiration of most of those who have examined it. Before further noticing this, however, it will be better to give a general account of the nature of the fence under consideration, the mode of its construction, and cost at which it may be set up in India.

The fence consists of strong uprights of wood or iron, called straining posts, with lighter intermediate ones at short distances, through all of which the horizontal wires are drawn. The first named of these are strongly fastened into the ground, and have spurs or stays attached to them. It is unnecessary to speak minutely of the mode in which these are made fast—this will be at once understood by inspection of the drawing at the end: the iron posts are battened with lead into blocks of stone—the wooden ones are fitted up with a sole piece, and struts—they ought to be sunk from two to three feet into the ground, and made extremely firm and secure: a want of due attention to this point being the error most generally committed by beginners in the setting up of fences. The wood ought to be lightly charred when under ground, and well pitched or dammered over. I have set up straining posts without a sole piece where the rock in its natural position could be made use of for stepping the upright and strutting the spur—but unless the utmost attention is paid to this, the post is so apt to give way, and the wires to slacken, that I cannot very greatly recommend the plan.

There is no very exact rule which requires to be observed as to the distances at which the straining posts ought to be placed from each other—where the fence is straight, 200 yards is not at all too far:—those along the terrace at the Society's gardens are 180 yards from each other, and are found not inconveniently remote. Where the fence is curved, the distance ought to be less, this being regulated by the nature and amount of curvature.

After the straining posts there are two varieties of uprights: the one kind are pretty strong—if of wood, deeply sunk and well secured into the ground—if of iron, battened with lead into blocks of stone about 20 or 25 inches cube, the larger the better. These ought to be placed from 50 to 70 yards apart from each other. For the ligther uprights, I have found bamboos to answer remarkably well—they are slightly charred and pitched, and sunk about two feet into the ground, having holes drilled for the wires to pass through. These are probably the best and cheapest uprights that can be had—they ought to be from $1\frac{1}{2}$ to 2 inches in diameter.

Iron uprights are made of the lightest sort of bar iron $1\frac{1}{2}$ inches broad by $\frac{1}{3}$ inch thick, perforated for the wires, and inserted into a block of stone 10 to 12 inches cube, the larger the better. They should be placed from 6 to 8 feet from each other.

The stone requires no dressing whatever, and care should be taken that the hole made for the reception of the iron is at least two and a half

inches deep. The natives are apt to make it a great deal too wide; this incurs a useless expenditure both of labour and of lead; and besides this waste, it makes much less secure work than when no more than a quarter of an inch or so is left all around the iron. The lead when cold should be driven up with a blunt chisel. The hole should be made to spread out a little, or be somewhat wider at the bottom than the mouth—this tends to secure the upright as if by dovetail. The blocks being all carefully placed along the line of the fence, the uprights are put in their places—a hemp string being drawn through the top hole to make the line eye-sweet; a second string is stretched along the ground, to which the edges of all the uprights are carefully brought up,—they are then secured with lead. Considerable nicety is required in this, as the fence looks most unseemly if any of the uprights deviate from their proper positions. The surfaces of the blocks should be so disposed as to permit two or three inches of earth to be thrown over them, so as to bring them up with the level of the ground, and conceal them entirely from view.

It is considered better to bat in the uprights first, and then set the blocks in which they are inserted into their places in the ground: I have here pursued in part the opposite plan; it does not appear very material which is adopted. If the blocks are of free stone they ought to be considerably larger than when of trap or granite. The earth should be very gradually filled in, and carefully beat and driven down about them.

The line of fence being now prepared, and the uprights ready to receive the wires, the next thing is to prepare the wire for insertion—for which purpose it first requires to be straightened from the coil in which it arrives. The wire, as has been already stated, is the finest and toughest kind of what is called charcoal wire: even when received as drawn, and with its original bright surface upon it, it has a very small degree of stiffness or elasticity, and may be twisted about with as much ease, and is as difficult almost to break as lithe copper wire.

The tools required for the further construction of the fence may be described as the manner of their use comes to be spoken of.

The first is a PEG BLOCK: it consists of a block of hard wood, 18 inches long, 5 broad, and 2 thick. It has strong pegs of iron inserted into it in the manner indicated by the adjoining cut. Each particular variety of wire has a block adapted for it,—if wire thicker than was intended is attempted to be stretched, then it will come out zigzagged or wriggled, like that which has been wove in gauze: if too thin wire is drawn through the block, then the straightening process is imperfectly performed. The size of the wire as fitted for the tool is indicated by the portion placed along the line of the pegs to diminish friction, and may be easily judged of by the eye.

The peg block is made fast by a bit of wire to a tree, a straining post,

or anything most conveniently at hand, and not apt to yield. The coil of wire is now unbound, and one end of it is passed through the staple at the end of the block, and along betwixt the line of pegs; enough of it being drawn through to make a loop through which a strong bamboo or piece of wood six or eight feet long should be passed; the loop being made tight about the middle of this so as not to slide, three or four coolies then take hold of the stick and pull the wire along. The person, meanwhile, who holds the peg block up with his left hand grasps the coil of wire firmly in his right, and hitches it rapidly around, as fast indeed as the drawers can pull it out. Where this is done by natives one man commonly takes the coil in hand, and another holds the peg block; an European can manage both with perfect facility. Care must be taken to permit no loops or twists to pass through the pegs, as it will afterwards be found difficult to straighten them. The wire must never be permitted to run off the coil spiral-wise, or it will be found impossible thoroughly to extend it; it must be uncoiled exactly like yarn placed upon a reel. This fact I found the most difficult of all to impress on native workmen. The various lengths of wire should be laid along the line of fence nearly as they are to be put through, and should on no account be bent or twisted unnecessarily after they are stretched. The straightening process, which has thus been described at such length, is, when rightly gone about, a remarkably easy and rapid one—one at which the natives speedily become very expert. But if the plan here laid down be departed from it will be found cumbrous, circuitous, and troublesome.

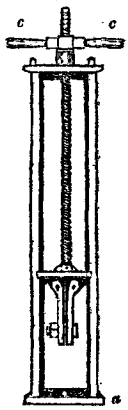
The wires are now to be run through the holes in the uprights; this is also accomplished with very great celerity. The three uppermost wires are the thickest; the four next are of intermediate size; and the two lowest the thinnest:—that is on the supposition that it is a nine-wire fence, and that wires of all the proper sizes are at command. As a general rule, it is sufficient that the thickest wires be placed uppermost, and the thinner ones lower down; the thinnest being next the ground. I have put up wire fences here which suit very well with wire of one size only.

The ends of the wires having been passed through the first straining post, and turned round one half the post, the end must be twisted twice or thrice round the horizontal portion which forms the fence. This is effected by the adjoining stirrup-like tool, which is taken in the hand, the wire being thrust through any one of the four holes which most nearly suits it. When the wires require to be united, they are first turned back and hooked into each other, and then turned round so as to form a tie like that of a bell wire; the tool just mentioned suits very well for this, though a wooden block 7 inches long by $2\frac{3}{4}$ broad, and $1\frac{1}{2}$ deep, with a couple of pegs in it, is now more commonly used. The proper performance of the tying process conduces greatly to the production

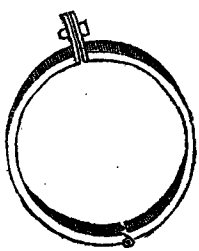
of a neat and workmanlike job: beginners are very apt to be negligent and slovenly; this is a thing the more inexcusable, as perfect neatness and finish is very easily attained by a little care. When the knot is finished, and the wire finally straightened, all the ends ought to be cut off with a common triangular file. The adjoining diagram represents a properly tied knot where the wire is of medium size.

The wires being now drawn through all the uprights on to the part from which it is proposed to apply the screw, are passed about six or eight inches through this.

The screw itself consists of a strong rectangular frame 24 inches long, the cheeks being 3 broad, and half an inch thick, and the distance betwixt them 4 inches. Along this moves the screw, with a vice at its extremity, kept in its place by the cheeks or guides, as represented in the adjoining diagram. The end of the wire is inserted in the teeth of the vice, and pulled through so as to let the abutting plate *a* come in contact with the straining post. A piece of wood about 2 inches thick is placed immediately on the under side of the wire, and betwixt the abutting plate and the straightning post, this permits the easy application of the collar vice (whose use falls next to be explained) immediately above the wire. The screw is now pulled out by the application of the levers at *c* and *c* till the wire is drawn to its proper tightness. It ought to feel perfectly rigid, and like a bar to the hand all along. The tyings should now all be examined—if any of them have given way, which they will only do in cases of very slovenly workmanship, they must be renewed—the wire which has been strained to its full stretch being slackened on purpose.



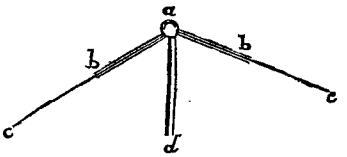
The collar vice is a strong iron hoop, about 15 inches in diameter, 2 broad, and half an inch thick, closing at one side with a screw, and united by a hinge at the opposite: it is placed around the post and pressed against it just above and in contact with the wire which has already been strained. It is made to seize hold of this by the vice teeth and screw on the inside of the post, and the whole being made perfectly fast, the straining screw is slackened and removed. The end of the wire, now freed from the last named tool, is turned half round the post and tied in the same manner as was the original one. The uppermost wire is that which should be,



first secured, and then the second and third, and so on in succession: care should be taken that none of the wires are strained so hard as to slacken any of those which have been placed over them. There is no other limit to the extent to which they may be drawn.

Previously to working the straining screw a temporary spur might occasionally be placed with advantage against the post from which the wire is strained; this may be removed so soon as the fence has been carried on to the next straining post.

A wire fence carried on as far as possible in a straight line is much cheaper than are curved ones, because posts with spurs are only required at the extreme ends of the line. When an angle is to be turned, instead of having the corner post supplied with spurs on each side in the direction of the line of fence, a single spur bisecting the angle will, on the principle of the resolution of forces, serve for both. It would be well that this spur were slightly divided, so as to have a double tail, split about six inches, to bat into the stone in case of any irregularity of strain, or inaccuracy in placing it, so as to counteract the pull of the wires.



a the post, *a c* and *a c* the lines of fence, *a b* and *a b* the spurs, *a d* the single spur bisecting the angle, which will serve instead of the two spurs *a b* and *a b*.

If the lesser uprights be properly fitted with spurs, placed in the direction of the centre of the figure, the fence may be made to sweep round a circular plat, or take any other curve, however abrupt, that may be desired. Strictly speaking, indeed, it can in no case form a curve, but a polygon of any given number of sides, each of which to the extent of six feet at least is straight.

It must not be supposed from the length of this description that there is any thing in the least degree difficult or tedious in the construction of wire fences; so much the contrary of this is the case, that a hundred yards may easily be finished of a morning after the uprights have all been properly set up. I have gone thus far minutely into details, giving an account of almost every possible difficulty that the beginner is likely to encounter, to enable him to have a fence set up with as little trouble as possible. It will be a long time before men regularly instructed in the art, simple though it be, can be looked for in India, wherever fences of this sort may be desired to be erected.

So far as my own experience extends, I should say the natives were remarkably easily taught the use of the tools, and speedily became very expert in handling them. I set up nearly 100 yards in the Observatory compound with wooden straining posts and bamboo uprights: and again in the case of the beautiful fence at the Agricultural So-

ciety's gardens—I went out and remained at the gardener's bungalow for some time, while this and one or two other novel operations were in progress, and found not the slightest difficulty in instructing the mallies, who seemed anxious to learn, and greatly delighted when they attained proficiency. Of course it is in vain to hope to instruct natives who never saw a wire fence—and who when the various parts and different tools are laid before them, have not the most remote idea of the manner in which they are to be employed, or the ultimate object designed to be attained, by means of mere verbal directions. An European must put his hand to the work and first shew them what is to be done, and the result desired to be accomplished, and he will speedily find all difficulties vanish. On no account ought slovenly work be permitted to pass at the commencement: posts set negligently up—wire badly straightened, or a knot clumsily tied—these and all other imperfections which might accidentally pass unnoticed at the beginning—and which European workmen would afterwards learn to avoid, natives take as copies; and imitate on system the blunders committed by accident.

When the fence is completed, it should be well painted or pitched: at home they generally use coal tar: here I have found common dammer very suitable.

The ground underneath it all along ought now to be dressed and smoothed over—the stones being covered with earth—the uprights of all descriptions thus appearing to spring from the ground.

It is only necessary to put in a few extra wires at the bottom to make the fence a perfect protection against lambs, hares, rabbits, or any other animals desired to be excluded.

It is sufficiently strong to resist the charge of a horse, or the pressure of cattle,—both of which, however, speedily become very wary of coming against it from the disagreeable sensation it occasions when run upon; it resumes its former position the moment the shock is past or pressure removed.*

In ordering a wire fence to be prepared for any enclosure, the following information requires to be given before a satisfactory job can be expected: 1st, the purpose for which the fence is intended—such as a lawn or park, a pleasure-ground or garden-enclosure; 2d, the nature of the ground, whether hilly or level; 3d, the character of the fence, whether straight, curved, or angular,—and if either of the latter, the amount of the curvature or angularity. In truth, a ground plan of the enclosure drawn to a scale, and containing also a section of the

* Pamphlet on Wire Fences by Mr James Young, Ironmonger, Perth. There are no directions given in the pamphlet as to the manner of setting up wire-fences. Mr Young is the person who supplied the Agri-Horticultural Society with its fences, and nothing could have been more perfect and complete than the manner in which they have been executed.

more irregular portions of it, ought to be supplied. The number of gates, apertures, or breaks, and consequently the number of end pillars, and the height of the fence when finished. If these things be attended to with tolerable care, a fence can be constructed at home and sent out to India infinitely cheaper than any variety of wall or rail, whose erection here will be the simplest thing imaginable.

Mr Young, of Perth, by whom the Agricultural Society has been supplied, has had more experience in this way than any man I am acquainted with, having, I believe, set up many hundreds of miles of fence: he has no agent in Bombay, but could at once supply fences on reference for payment being given, or remittance made. Messrs Elsam & Co. seem the only parties here who have had much experience in this matter: they assure me of their willingness to supply every sort of information required, and to attend to any orders which may be given them.

The Society has two complete sets of tools, which are very willingly lent out; this saves the expense of purchase to those who only desire to have a small amount of fence set up. The tools cost about £2, 10s. a set.

In reference to the expense of the construction of a wire fence, it will be seen from the note of Sir Alexander Muir Mackenzie, that in Scotland it can be set up of the simplest sort for 6d. a yard; and by using jungle wood for straining posts, and bamboos for up rights, 80 yards cost me Rs. 25, or something less than a rupee for every three yards.

The following is Mr Young's account for 400 yards of fence supplied to the Society, which cost in all £60, so that the expense of this amounted to about 3s. or Rs. 1½ per yard; this without including cost of freight, duty, or setting up. The reason of this apparently high rate of charge is that the fence is of very unusual height and strength; this being considered requisite from the extreme hilliness and irregularity of of the ground for which it was intended—the Society at the time it was ordered entertaining the hope that they might be permitted to enclose Parell-hill for the purposes of experimental Arboriculture. The fence is four and a half feet high, with nine wires. The bearing posts are only 50 yards apart, and the uprights were intended to have been no more than six feet asunder; they have been put up at a distance of eight feet from each other, and are found to be near enough.

Perth, 23d August, 1842.

The Agricultural and Horticultural Society of Western India, — To James D. Young,

To	200	Strong Malleable Iron Standards, @ 2s. 2d.		£21	13	4
—	9	Strong do. Pillars, ... 18s.		8	2	0
—	2	do. do. Double Spurs, ... 13s. 8d.		1	7	4
			Carry forward, £31	2	8	

				Brought forward,	£31	2	8
To 630 lbs.	Prepared	Fencing	Wire,	No. 4. @ 3¼d.	8	10	7½
— 630 ...	do.	do.		No. 6. ... 3¼d.	8	10	7½
— 250 ...	do.	do.		No. 8. ... 3½d.	3	12	11
					£51	16	10
— Painting Standards and Pillars, one coat,				£1 5 6			
— Strong Box for do. do.				1 12 6			
— Matting for 5 Bales Wire,				0 15 0			
— Roping 3s. 6d., Cartage 3s., Porterage 1s. 6d., Shore Dues 3s. 6d.				0 11 6			
— Pigs and Eye-blocks enclosed,				0 8 6			
— Paid Freight and Charges to Bombay,				4 16 6			
					£9	9	6
					£61	6	4

The freight and duty come to but a trifling sum. I cannot exactly speak of the cost of setting up the fence, as the work was chiefly done by the garden mallies, extra work-people having been required for the construction of a terrace of which the fence formed one edge. Nor would information on this point be of much avail to others, as the charges of erection must depend on the price of labour and facility with which stone can be obtained at the place where a fence is desired to be erected.

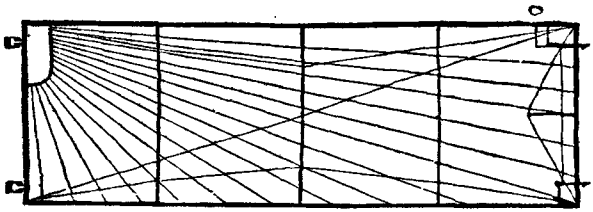
No greater improvement in the appearance of the bungalows at Poonah or Kirkee could be effected, than by the substitution of wire fences for the prickly pear hedges, which now everywhere deform them.

Were a line of wire fence with gates to correspond, substituted on the Bombay esplanade, for the present jagged and irregular bamboo trellis work: it might be permitted to remain all the year round, even after the temporary bungalows to which it belonged were removed. It would in no way obstruct the view of the artillerymen on the ramparts, in case of a hostile force effecting a landing in Back Bay—the apprehension of which has hitherto, I understand, prevented permanent structures of any sort from being permitted to remain there throughout the year: and in the event of the alarms for approach of danger from this source diminishing or dying away, the flowering creepers which are annually destroyed with the railings which support them, and which have barely attained maturity when they are required to be removed, might be permitted to remain with the wire fence all the year round.

There are in fact few military stations in India, the aspect of which would not be infinitely improved by the introduction of this species of enclosure. These observations may be concluded by the republication of a portion of a paper by me, which was read before the Highland Society of Scotland in 1842, on the construction of

field gates in general,—the part about to be quoted describes wire gates only:—

Fig. 1.



"*Newly Constructed Wire-Gates.*—Having thus minutely directed attention to the various forms of field-gates now in use, it appeared to me, that, by the proper combination of iron-bars and wires, a much more economical, light, elegant, strong, and durable gate might be formed, than any of those now generally in use. The first point to which attention was directed was, that, in exposing the finer wires at all times to a pulling strain, the filling up of the gate should everywhere brace and strengthen the bars of the framing. The gate marked fig. 2 was the first designed with these ends in view. That marked *fig. 1* is the framing of fig. 2 devoid of its rays, and forms of itself an exceedingly light and efficient gate, though not perhaps quite adequate for keeping in lambs, or excluding hares, rabbits, or game.

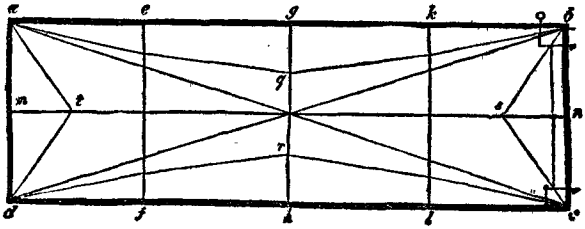
"The framing *a b c d*, fig. 1, is fashioned like that of an ordinary gate, the bar-iron being considerably lighter than in these; *e f*, *g h* and *k l* are three light slips of iron parallel to the ends of the gate, and rivetted to the upper and lower rails; *a p b* is a wire, about the thickness of a goose-quill, fastened by a rivet and counter-sink at one end, and a screw and nut at the other: it pasess through holes in the slips *e f*, *g h*, and *k l*, and serves as a brace to support *a b*.

"In the same manner, *d p c* serves as a brace to *d c*, while the two sides of the gate being coupled together by the slips *e f*, *g h* and *k l*, the lower and upper rails have severally the benefit of both braces. The diagonals *a c* and *d b* keep the frame in shape, while *a s d* and *b t c* are braces to *a d* and *b c*; *m n* is a light strap of iron, not required in the rayed gate, fig. 9. It will now be seen that all the wires and straps, which act as fills-up, are either braces or supports, so that nothing can be more stiff than the gate thus completed. It weighs about 80 lbs., and costs £1, 8s. Its dimensions are 9 feet by 3½, but may be made of any size, the price being altered in proportion. It will be observed, that a gate with one bolt, when shut rapidly vibrates for some time at the fore-foot; this is completely obviated by two bolts, coupled together, and acting simultaneously. This has the additional benefit of doubling the chances of the gate securing itself when shut. It is also convenient for gates opening into policy-grounds getting bolted when thrown back, by means of a short stump driven into the ground, with a catch just the height of the lower bolt.

"In the rayed gate, fig. 2, the framing, as already stated, is exactly the same as that just described—the horizontal strap *m n* and the brace *a s d*

being omitted as superfluous. The rays consist of wires or rods the thickness of a goose quill, and about 9 inches from each other. Their lower

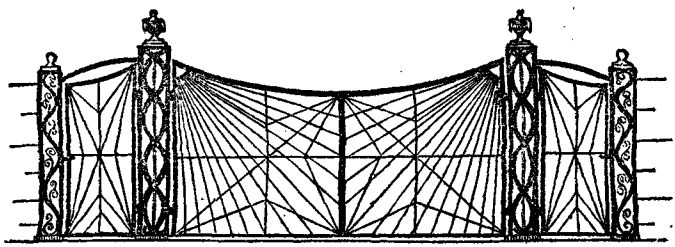
Fig. 2.



extremities are driven up into nail-heads or rivets; their upper ends are fastened with a nut and screw. For the accommodation of these, a strong iron arch is placed in the corner of the gate, and made fast at both ends by a nut and screw. Its range down the heel part, as compared with that along the upper rail, should be as the length of the gate is to its height; that is, if the gate be 9 feet by 3, then the fastening of the arcs should be 18 inches down the heel part, and 6 along the upper rail. A gate of this sort, of the above dimensions, costs from £1, 15s. to £2, 5s.

"Not only are these eminently adapted for ordinary field enclosures, but more especially so for toll-bar gates and gentlemen's parks, or indeed wherever light gates of considerable span are required."

These gates are eminently suited for wire fences: they sell at home at from £2 to £2 10, and in Bombay for Rs. 25 to Rs. 30. The following is a somewhat more complicated arrangement of the wires on the same principle.



The carriage way of this gate is 11 feet, the wickets 2½ each. The whole space 17 feet. These gates cost £15 at home, and Rs. 180 at Bombay, where they are now to be seen in considerable numbers.

G. B.

HALL'S HYDRAULIC BELT.

It was hoped that the present number of the Transactions would have contained an account of the experiments of the Hydraulic Belt, constructed for the use of the Society, and proposed to be set up in their gardens. Some portions of this having given way just as it was about to be put in operation, and delays having occurred in certain alterations in other parts, found essential from the extreme depth of the well from which the water required to be drawn,—the rainy season approached before these could be carried into execution: so that nothing worthy of being narrated has yet been effected in the way of experiment by the Society.

The extended circulation proposed to be given by Government to the present issue, with a view to the dissemination of information on the best forms of wheel-carriages,* furnishes an opportunity too valuable to be overlooked, for making known as extensively as possible the results of the experiments at Surat by Captain (now Major) C. W. Grant, of the Bombay Engineers, with a machine constructed on Hall's principle by native workmen.

The velocity required to be given to the belt is stated by the patentee at 1000 feet a minute, and the multiplying parts intervening betwixt the original source of power, and the roller over which the belt moves, must be regulated by this.

There is no doubt whatever but that, by certain very simple adaptations, either the power of bullocks or the force of the wind might be applied to drive the machine without any machinery being required either more complicated or refined than that which the native workmen could produce. The use of the old-fashioned *trundle*, or *rung* and *pinion* as it is called, figured and described page 39, might, if applied to the common spur-wheel so generally in use, act as first multiplier—bringing up the velocity to a point where drums, pinions and belts might be employed to give any speed that was desired. A thousand feet a minute, in fact, is something so perfectly moderate, that no great amount of multiplication is requisite for its derivation from the slowest of our primary movers.

An improvement of considerable magnitude has been suggested by an ingenious amateur engineer—Lieutenant Harry Barr, of the 2nd Bombay European Regiment, which, in so far as it has been tried, promises to be of much value in cheapening the construction of Hall's machine, and facilitating its transportation from place to place. According to his suggestion, the bottom framing is altogether dispensed

* Government intimated to the Society that they would take 200 copies of that number of the Journal in which Lieutenant Gaisford's paper appeared: it forms the opening article of the present one.

with, and in its place a roller, or even a piece of bamboo, loaded at each end with a large stone, is lowered from the top of the well, and placed carefully in the bight of the belt by means of four sustaining ropes. The belt by this means is kept moderately stretched, so as not to permit the ascending portion to get entangled with that which is descending: an accident constantly happening when it is allowed to depend by its own weight alone, as was originally proposed by Mr Barr, and found to suit in very shallow wells. So far as has been observed, this forms a perfectly effective substitute for a foot-framing and bottom roller.

The advantages it presents are the following: 1*st*, It cheapens the machine by about a third. 2*d*, It permits the belt to be applied to any well of whatever depth, or with however much or little water, without trouble. 3*d*, It enables the belt itself, which is extremely apt to mildew or rot if left long immersed, to be withdrawn with the utmost facility, and laid aside to dry when not in use. 4*th*, It permits the whole machine to be transferred from one well to another with as little trouble as the Persian wheel itself can be transported: so that when the water fails at one place another may be resorted to where it is more abundant. 5*th*, One of the greatest benefits appears to be the increase of effect which it enables the machine to perform with a given power.

The Hydraulic Belt elevates the water on the principle of simple adhesion; and it will be apparent to any one who observes the commotion occasioned by it at the surface of the contents of a well, that the more lightly it is in contact with the fluid, a portion of which it is meant to raise, so much the better, provided it be just sufficiently so to "lick up," so to speak, as much as can be made to adhere to its surface. In cases of deep immersion, it is plain that the descending limb must be greatly obstructed in its downward progress from the surface of the water to the bottom of the well, by the same principle of action on which the efficiency of the belt itself depends: and, in like manner, the ascending limb is carrying, from the first roller upwards, to the surface, through the whole space to which it has been immersed, a load which would have been imposed on it in sufficient time when it was about to quit the water altogether. This evil must increase in proportion to the quantity of water in the well, assuming that the foot-framing and roller are placed at the bottom. By having recourse to Lieut. Barr's contrivance, if found otherwise to operate, the bight of the belt may be lowered just enough below the surface to permit adhesion,—say five or six inches and no more: and this may be adjusted by lengthening the belt from time to time as the water is drawn off.

It is not to be forgotten that the advantages here described, from the proposed alteration, are in a considerable measure hypothetical; they have, as yet, only been partially proved by experiment, but on no occasion where trial was made was there any reason for doubt left as to

the likelihood of their realization. They strictly accord with the theory of the machine.

Captain Grant has stated the absolute effect produced by his machine with a given amount of power; we are not at present in possession of any sufficiently trustworthy experiments to enable us to compare it with the performances of the Persian wheel. It would be very interesting to know the "*duty*" of this simple and admirable implement in various parts of India: that is, how much water one man would raise in an hour from an ascertained depth of well. Few facts of so much interest could be determined with similar celerity, and so little trouble.

Account of the Construction and Operations of Hall's Hydraulic Belt, erected by Captain C. W. Grant, at Surat, in a private Letter to the Secretary of the Society.

At last I send you a drawing and memorandum of my Hydraulic Machine, at which, I much fear, you will be disappointed; it being but a very common-place thing after all: but my object has been to make a machine that could be constructed by any common carpenters or blacksmiths,—and so far I have succeeded. The gudgeons of the large wheel, pulley and rollers, work on prop pillows or props, but they are merely filed round by eye: if turned in a lathe, the friction would be mightily diminished, and a much better result obtained. The woollen band is the proper thing, but after six or seven days' immersion in the water, and use, it became so completely rotten that I was obliged to try the coir, which is, however, less *elastic*, and does not imbibe nearly so much water as the woollen band. I dare say a thick strong woollen band might be made and steeped in some preparation (a decoction of Baubee bark) that would preserve it from rotting so soon. It is very pretty to see the water clinging in a mass to the belt as it comes up, and when I like, the men can throw the water upwards of three feet above the wheel, like a fountain—very pretty to look at, but surely waste of power. The driving wheel is made exceedingly heavy at the rim, and very light at the nave, to act as a fly wheel, which it *really* does very effectually, though the knowing ones tell me that it cannot, because it carries the leather belt, but that if the lower wheel were very light, and a heavy wheel *fastened* on to it, it would then act as a fly wheel: this is a principle of action which perhaps you can explain to me. My machine costs about 70 rupees, and answers very well to water a small garden, or to draw water for household purposes; but I doubt its ever superceding the old *bullock koss*, the simplest hydraulic machine possible, and so well suited to the indolent habits of the natives, easy of construction, and not liable to get out of repair. With *true* gudgeons and Europeans, the effect would be very great: as it is, I think it not amiss for black men, but my machine is too large for two men. The advantage of not using bullocks is, that bullocks draw

a certain quantity of water, and then do nothing till the evening. My two men draw the water, and attend to the garden besides. I should think it might be made to answer splendidly for pumping out ships' holds; but it is nothing new—a mere modification or improvement on the old *rope* machine. The *speed* is the only new part about it. Sir R. Arbuthnot tried the thing on a large scale at Ahmedabad; a large horizontal spur-wheel, and a small vertical pinion, but it took twenty men to work it, and did not then produce more than nine gallons, raised 25 feet, in a minute by one man; this is *very good*, is it not?

My experiments may be rather too favourable, that is, the men could not go on all day at that rate, but long enough to drain my well in a very short time. Where the well has a retaining wall, the wheels carrying the leather strap and belt may obviously be made to rest on small planks, laid or set into the top of the wall, and all the frame-work shewn in my drawing, for that part might be saved: in the same way, the roller at the bottom of the well might be fixed without the side pieces used in my well, which is *cutcha*, dug through sand, 3 feet in diameter, and the sides being supported by what we call *kunds*, or cylinders of burnt clay, about one foot in height, and three feet in diameter, placed one on the other like pans without bottoms,—a very common practice in sandy soils, a small wheel of wood being first laid on the bottom of the well to serve as a foundation for the *kunds*. The well is dug and built up in a couple of days; and mine, 3 feet in diameter, and 25 feet deep, cost, I believe, about 20 rupees, or less. I have sent a copy of these drawings to Col. Dickinson, who wished to have one—at least it goes by post to-day. Remember the wheel at the bottom of the well should have a very large flange or projecting rim, to prevent the belt getting off it, as it stretches at first and remains loose, which incurs a vast deal of trouble.

Memorandum of Work performed by the Hydraulic Belt.

I have for a cistern one hogshead (ale measure,) and one half hogshead, = 81 gals. = 810 lbs.

1st Example.—With a woollen belt, about 7 inches broad, 4 men filled the hodgshead and half hogshead in $1\frac{1}{2}$ minutes, raising the water 25 ft.

2d Example.—With a coir belt, 4 inches broad, 3 men filled the hogshead and half hogshead in 3 minutes.

3d Example.—With a coir belt, 4 inches broad, 2 men filled the same in 4 minutes.

1st Example.—$1\frac{1}{2}$ hogshead = 81 gals. raised 25 ft. in $1\frac{1}{2}$ min., or 54 gals. raised 25 ft. in 1 min. by 4 men; then 54 gals. = 540 lbs. $\times$ 25 ft. = 13,500 lbs. by 4 men; or 3375 lbs. raised 1 ft. per minute by 1 man; or $13\frac{1}{2}$ gals. raised 25 ft. in 1 minute by 1 man.

Smeaton, from numerous experiments, reckoned a man's power

equivalent to 3750 lbs. moved 1 foot per minute, or half a cubic foot of water, or 31¼ lbs. raised 2 ft. per second; therefore, 3374 lbs. raised 1 ft. per minute is equal to 90 per cent. of actual power.

2d Example.—1½ hogshead = 81 gals. raised 25 ft. in 3 min. = 27 gals. raised 25 ft. in 1 minute by 3 men; then 27 lbs. = 270 lbs. × 25 ft. = 6750 lbs. by 3 men, or 2250 lbs. raised 1 ft. per min. by 1 man, or 9 gals. raised 25 ft. per minute by 1 man, which is equal to 60 per cent. of actual power.

3d Example.—1½ hogshead = 81 gals. raised 25 ft. in 4 min. = 20¼ gals. raised 25 ft. in 1 min. by 2 men; then 20¼ gals. = 202½ lbs. × 25 ft. = 5062 lbs. by 2 men, or 2531¼ lbs. raised 1 ft. per minute by 1 man, or 10 gals. raised 25 ft. per minute by 1 man, which is equal to 67 per cent. of actual power.

It appears from the above, that the woollen belt of 7 inches in breadth is of comparatively much more power than the coir band of only 4 inches broad, or rather that the large belt is better proportioned to the size of the machine than the small one; and I should think that a belt of 7 or 8 inches, with 4 men, would be the most effective rate of the machine; the velocity of the large wheel 1 revolution per second, or 18 feet per second at the circumference, or 1080 feet per second, which is as great as is required.

The 1st experiment may be a little over rated, as I do not think man could keep it up at that rate for any time; for a permanent effect, the 2d experiment is the nearest: but there, it is clear that the breadth of the belt is too little for the wheel, so that power is lost.

The 3d experiment is what I always work my wheel at, it not suiting my purpose to employ more than 2 men on the work; but these men are gardeners, and drawing the water occupies but a very small part of their daily labour.

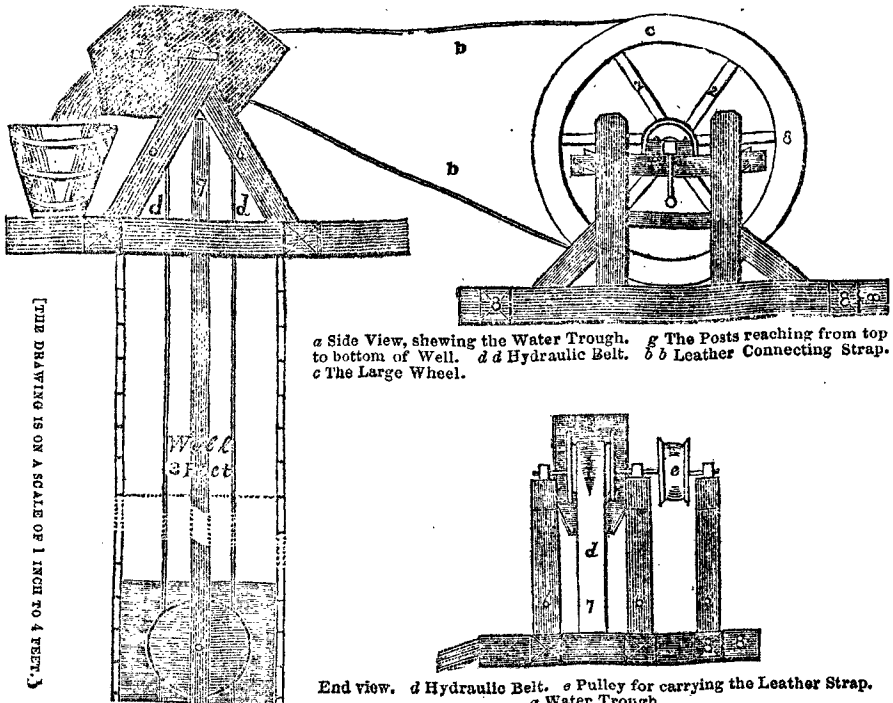
I found by trial, that 1 pair of buffaloes can lift 84 gals. of water, 25 feet in 3½ minutes or nearly 4 minutes, or about 22 gals. per minute: 22 gals. × 10 = 220 lbs. × 25 ft. = 5500 lbs. raised 1 foot per minute by 1 pair of buffaloes, or only a very little more than is raised by my belt by 2 men.

The woollen belt becomes so rapidly *rotten* from remaining constantly immersed in water, that I have been reluctantly obliged to resort to a *coir* belt or flat rope.

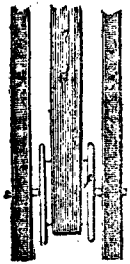
C. W. Grant.

1*st July*, 1842.

SKETCH OF A HYDRAULIC BELT, TO BE WORKED BY THREE OR FOUR MEN.

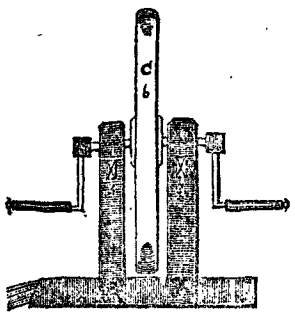


a Side View, shewing the Water Trough. *g* The Posts reaching from top to bottom of Well. *d d* Hydraulic Belt. *b b* Leather Connecting Strap. *c* The Large Wheel.



End view of Roller at bottom of well. *f* Roller. *g g* Two posts reaching from the top to the bottom of the well, in which the roller is fixed. *d* Belt.

End view. *d* Hydraulic Belt. *e* Pulley for carrying the Leather Strap. *a* Water Trough.



End view of Large Wheel, *c*.

[THE DRAWING IS ON A SCALE OF 1 INCH TO 4 FEET.]

ON THE INTRODUCTION OF THE THRASHING-MACHINE INTO INDIA.

To the Editor of the Transactions of the Agri-Horticultural Society of Western India.

SIR,—As no alteration whatever appears to have occurred in the east, in the manner of treading out the corn, since the days of the patriarchs,—the hoof of the ox being now employed in the same manner, and as universally and uniformly, as it was 3000 years ago,—the leap in improvement from this to the thrashing-machine, which I think the natives might be induced to take, will, I doubt not, seem much too hazardous to be ventured on. We shall see presently.

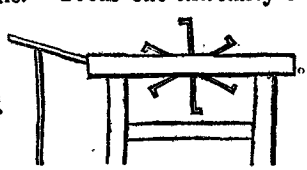
Not only do I not believe the flail or swing ever likely to be introduced into the East,—both from the labour it occasions, and the manner, so uncongenial to native usages, in which it requires to be used—but the simple contrivance I am about to describe was resorted to by a hardy Scotchman, perfectly accustomed to wield the flail, and without any prejudice against it; who preferred having a greater amount of work done with less labour to himself, when this could be compassed by the construction of a rude thrashing-machine driven by the wind, than by the simple instrument he had been taught to wield as his fathers had wielded it before him.

In the autumn of 1838 I chanced to reside in one of the central counties of Scotland distinguished for the skill of its farmers. In the neighbourhood alluded to there were some extensive stone quarries, and as is not unfrequently the case, divers of the workmen feued or rented small tenements or crofts of from 5 to 15 acres, which they and their families cultivated, two or three of them clubbing together to keep a pair of horses, which would have been too expensive for any one of them. The horses were, like their masters, employed the principal part of their time in performing work connected with the quarry,—the farming of the croft being a secondary affair. At the back of the house of one of these poor but industrious men, I was surprised to find a coarse wind-mill chiefly employed in the rainy weather, when out-of-door work could hardly be performed. It had four arms about 3 feet long each—the diameter of the whole being about 7 feet,—the vanes were made of coarse wooden boards put roughly together, and the axle consisted of a round pole on the middle of which was a sheve or pulley fitted with a groove, to receive the rope which drove the machine inside. There were no journals or plumber-blocks, brass or iron work about the mill, and the whole might have been fitted up, and I dare say was so, in the course of a forenoon, with no other tools but a saw, an axe, and a hammer. The axle could be taken off, and reversed, so as to

make the vanes face east or west; but could not be veered around to any of the intermediate points of the compass. From east and west, however, the breeze chiefly blew: as it is not requisite that the wind shall be exactly in a line with the axes of the vanes, but will work the mill well enough though a good many points to the right or left of this —the mill served very well; refusing only to do its duty when the wind was nearly north or south.

Now, I will undertake, Sir, to make a native meistry construct in a couple of days, from a dozen of good bamboos, a far more handsome windmill than that just described. The vanes I would have covered with cotton cloth or coarse matting of any sort. And now comes the Thrashing-machine, which the Windmill without was meant to drive; but of this you must allow me a diagram before I can hope to make it intelligible.

It was exactly on the principle of this machine of Meikle, now universally used throughout Scotland, but stripped of all its more cumbrous details. In fact, the worthy quarryman had introduced nothing which could be dispensed with, and which he and his son could not make with their own hands. It consisted simply of the kitchen table, with a sloping board about one foot broad attached to the edge of it next the beaters. It was about three feet in length. The beaters or drum —in reality drum there was none—consisted of an axle parallel and nearly on a level with the surface of the table; to either end of this were attached six arms, or more properly speaking, three, for they extended across, and were merely nailed to the axle. From one extremity of each of these to the other, stretched along a single spar or beater: the whole was so arranged, that when this reel-locking contrivance was turned around, each of its arms approached within about half an inch of the sloping board already described.



The extreme simplicity of the formation of all this will be seen by inspection of the diagram. The supporters of the axle are two pieces of wood at each end, crossing each other and forming struts in fact to the table; as in the case of the propellant there were no journals, plumber-blocks, brass or iron, save the nails which kept it together. On the extreme end of the axle, most nearly opposite to the sheve of the windmill, was a small-sized sheve or pinion, about 4 inches in

diameter. Over this was placed the driving rope, a plough line, as it is called, about the thickness of your little finger: this also went round the larger sheve on the windmill axle. The one of these being 14, and the other 4 inches, in diameter, it is clear that for every revolution made by the windmill, the sheve of the thrashing-machine would make five, and this was found equal in a brisk breeze to about 30 strokes a second—a velocity quite sufficient for ordinary purposes.

To those who have never seen the thrashing-machine of Meikle, I doubt if what I have said, or am about to say, will be intelligible: to those who are acquainted with that invaluable implement, a simple inspection of the diagram will be enough. Two people were required to work the mill: the old man took up the sheaves of corn lying around him, cut the band, and spread the stalks on the table, pushing the heads gradually forward, and holding the straw firmly in his hand, while the beaters, now in rapid motion, knocked out the grain. A little experience speedily gave perfect dexterity, and ensured success in this.

The straw being let go by degrees as it was thrashed, fell down along with the grain on the floor under the beaters. The other man was here employed with a stable fork shaking the grain and chaff from out the straw, and leaving the latter for a time nearly where it fell: when accumulating in too great quantity, it was pushed aside so as to form a *bing* to be afterwards winnowed by the fanners.

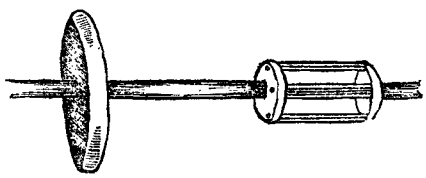
I have unfortunately kept no notes or drawings in reference to this very simple and efficient contrivance, but am sure I am sufficiently near the truth in my recollections for all practical purposes.

The contriver of the machine told me that he could not afford the expense of a more costly thrashing-mill, nor conveniently obtain the use of one from his neighbours: and that had he been able to meet the expense, the small quantity of work to be done made it not worth his while; but that in the rainy weather, when no work could be done in the quarry, if the wind blew strong, he and his son could, without toil to themselves, thrash twice as much corn in this way as with the flail.

As the employment of wind as a moving-power is new to the natives, and will of course be resorted to with aversion, as all innovations are, I would beg to suggest the following mode in which human power, employed in the same way as on the Persian wheel, or bullock power could be resorted to;—fit up the tread-mill part of the wheel in a position conveniently near for the thrashing-mill, and to one end of it attach a spur wheel similar to that now used in bullock-gins for raising water. Make this drive the old-fashioned trundle or rung and pinion,—but this, I suspect, I must describe to you.

It consists of two circular pieces of wood about a foot in diameter, and 2 inches thick—these are placed on an axle, and separated about 1 foot from each other: 4, 5, or 6, upright spokes, about two inches thick, are placed between them, parallel of course to the axle, and equi-

distant from it. These constitute the teeth of the pinion, into which the teeth of the spur-wheel work. If we suppose this latter to be 3 feet in diameter, and to have 24 teeth —a trundle with four rungs will make six revolutions for every one performed by the spur-wheel. This will give velocity enough for a smooth drum or sheve, of say 2 feet diameter, placed on the same axle with the trundle, and driving the sheve of the beaters, which we shall suppose to be say 6 inches in diameter; and which will accordingly make thirty revolutions for every turn of the tread-mill part of the Persian wheel.



In the case of bullock power being resorted to, the axle of the trundle might be set upright, and in this case the sheve or drum would be horizontal—a matter of no consequence, as a half turn of the belt would bring it into a position to drive the vertical sheve of the beater on its horizontal axle.

You will pardon me if I am over-estimating the value of the contrivance of my humble Scotch friend: I scarcely think that I am wrong in assuming both the possibility and the benefit of its introduction amongst the cultivators of India.

SCOTUS.

NOTE.—Scotus appears to forget, that a kitchen table will be nearly as great a novelty amongst the cultivators in India as a thrashing-mill itself; and that the latter is likely much sooner to be known as an implement than the former. We have on this account taken some liberties with his sketch: as the only use of the table is to sustain the corn while in the act of being fed in to the beaters, a simple board, with a pair of bamboo supports, seems quite sufficient for the purpose, or a slight flooring of bamboos altogether, should this be considered more attainable. The frame to which the beaters are attached ought to be strong and firmly put together, to avoid injury from the rapid movements of the machine. A rail ought to run around connecting and strengthening the feet, this has been omitted in the perspective view to avoid confusion, but is indicated in the elevation. The driving-sheves and rope are supposed to be at the further end, and so of course partly hid from view.—EDITOR.

REPORT ON THE STATE AND PROGRESS OF AGRICULTURE IN THE DECCAN FOR THE YEAR 1842.

By Dr Alex. Gibson, Superintendent of the Government Botanical Gardens.

[presented by government, june, 1843.]

To G. Buist, Esq., Secretary to the Agri-Horticultural Society.

Sir,—I am directed by the Hon'ble the Governor in Council to transmit to you the accompanying copies of a letter, No. 1432, dated 6th October last, from the Revenue Commissioner, with the Report of Dr Gibson, Superintendent of the Government Botanical Gardens, therein referred to, and of my reply to the Revenue Commissioner, dated this day.

I have the honour to be,
Sir,
Your most obedient servant,
L. R. Reid, *Chief Secretary.*

Bombay Castle, 13*th June*, 1843.

To L. R. Reid, Esq., Chief Secretary, Bombay.

Sir,—I beg to hand up Dr Gibson's Report on the progress of the Gardens under his superintendence, and of his Horticultural operations generally for the last two years.

2. Passing over the preliminary remarks on the condition and comparative merits of the Dapoorie and the Hewra Gardens, the first point in the report, both in order and importance, is the result of the experiments in *cotton growing*, which, though pursued on rather a contracted scale, seem to have confirmed Dr Gibson in his former opinion, that the dry air and shallow soil of the Western Deccan are unsuited to exotic cottons. Government will observe with regret, that the same ill success appears to have attended Dr Gibson's experiments with the Upland Georgian species in the Dapoorie Garden, as resulted from last year's trials at Broach, notwithstanding that the seed was of the choicest description, and the soil the very sort on which Dr Wight's late experiments have been made, and from which, as I understand, so much is expected by Dr Burn in his operations during the current year, namely, the *red alluvial.* This conclusion appears to correspond with the result of the trial made last year by the Collector of *Kaira*, where the *red alluvial* soil produced the same scanty and diseased crop as followed the experiments made by the American planters in the black soil of Broach. It seems probable that soil, even the best, is not sufficient without other favourable circumstances of climate, situation, &c., &c.

3. Dr Gibson certainly notices that an average crop of this American cotton was picked from about a beega of land, planted by Mr Dickinson at Hewra; but this plot had the advantage of irrigation and other favourable circumstances; and the instance is adduced rather as a warning than an encouragement, and certainly it is not probable that ordinary cotton which requires irrigation will ever repay the grower to a large extent. Even in regard to the cultivation of the country cotton, Dr Gibson is of opinion that the climate and soil of the Western Deccan is decidedly unfavourable: he excepts Sholapoor and the Southern Mahratta country, where cotton is, in many parts, a regular crop.

4. Deserved praise is given to Mr Elphinston by Dr Gibson, for the perseverance with which he has followed up his experiments, which have fully proved the suitableness of the Konkan climate and soil for growing a very valuable exotic cotton, though he apprehends that the want of water may ever present a fatal obstacle to its being cultivated *with profit* in that country. Mr Elphinston's exertions in the advancement of cotton cultivation having been reported to Government on other occasions, and having been honoured by their approbation, I need not dwell on the subject here.

5. The cultivation of sugar cane is next, and is treated of in paragraphs 18 to 25. A favourable report is given of the Mauritius cane, the use of which is said to be on the increase around and south of Poona, and in the Sholapoor Collectorate, and many localities are said to exist along the line of Ghauts both above and below them, where this species of cane can be grown on *unirrigated* spots—a very important fact, both as regards the reduced expense of cultivation, and the superior quality of the produce. Powud, Khora, Kotool, above the Ghaut; and Dhurumpoor, below, have been named by Dr Gibson to me as places where this "Neespanee" sugar land is to be found.

6. Dr Gibson's remarks, paragraphs 20 to 23, on the policy of assisting the operations of the sugar factory at Hewra, by providing a more extended vent for the spirits distilled from the refuse molasses, and on the superior wholesomeness of the spirit distilled by Mr Dickinson (the agent for the Bombay Joint Stock Sugar Company) over the adulterated liquors of the country, are well worthy the attention of Government; but there is some misapprehension in Dr Gibson's allusion, paragraph 22, to the Jooneer liquor farm; and pending further explanation, I can submit no specific proposition in the matter.

7. The subject of refining sugar, and the difficulties that oppose the introduction of the most improved modes, are treated of in paras. 24 and 25; and some remarkable facts are stated, shewing how greatly the real design of Government, in the measures adopted for encouraging the growth of superior products, were at first misunderstood by the ryots. It is much to be regretted that this misapprehension was not sooner dispelled.

8. The progress made in the cultivation of several sorts of drugs and medicinal plants, occupies the report from para. 26 to para. 35. The subject seems properly to belong to the consideration of the Faculty, and might be referred with advantage to the Medical Board. By a subsequent communication I find, that since writing his report Dr Gibson has received the valuable Columba plant from Mosambique, *via* Damaun, in a most healthy state.

9. Of his experiments with the various *Cereal grains*, the seeds of which have been supplied from other countries, Dr Gibson does not give a favourable report (vide para. 37); neither the Vittoria Wheat of the Carraccas, nor the Rye and Oats sown, have flourished in a manner to recommend their further cultivation here. A subsequent communication however, received a few days ago, mentions that the American Maize, of which the seed was received in June last, was likely to prove a valuable addition to the corn grains of this country; and I have requested Dr Gibson to furnish the several collectors with seed, and directions for its cultivation.

10. The Potato continues to make its way, and is described as thriving very well in the neighbourhood of Jooneer. The cultivation has greatly increased, and already affords a large supply to the Bombay market. Some useful hints are added for preserving the root from a tendency to rot, which is inherent in the Jooneer species, as well as in that grown at Mahabuleshwur.

11, *Syrian Tobacco* is stated to grow well, *vide* para. 48. A specimen of this product of Hewra was forwarded to the Chamber of Commerce some months ago, and also to England for the opinion of dealers and others capable of judging how far it would answer for the European markets. Dr Gibson thinks, that by care he can improve on the samples already submitted.

12. As with Cotton, so with *Tea* and *Coffee*, in this part of the Deccan. Dr Gibson thinks neither of these latter articles can ever be cultivated as a *profitable* branch of agriculture here; though Coffee of the highest quality may be raised with care and expense; and some Tea plants at Mahabuleshwur look tolerably well (*vide* paras. 49 to 55). We know that Coffee of a very superior quality is raised in parts of the southern Mahratta country; and frequently, I believe, without the aid of irrigation.

13. In regard to the *Exotic* grasses, of which he has been supplied with the seeds of many choice sorts, Dr Gibson is of opinion, that except where a great degree of moisture prevails, they will never succeed in this part of India, nor have any chance of superseding the native kinds—of which there are several, common both in Guzerat and the Deccan,—where the cultivators also are in the habit of supplying the deficiency during the hot season, by green crops grown solely as fodder for cattle. The oil made by Dr Gibson from the Ground nut, mentioned in para. 82 as a superior sort of Salad oil, was tried by Co-

lonel Jervis and myself, and we did not find it very palatable. Specimens, however, have been sent to the Chamber of Commerce for their opinion on its merits.

14. The rest of the report is occupied chiefly with trees, both Forest and Fruit, on which I have only to remark, that as it is not to be supposed the people of the country will remain for ever as indifferent as they now are, it is of great importance to ascertain, by actual growth, the description of trees best suited for general diffusion throughout the country.

15. There are some observations at para. 81, on the *Ceratonia siliqua* or St John's Bread (the Carob tree,) about which, and the possibility of its general introduction into this part of the country, a reference was made by Government in their letter to my predecessor's address (No. 82 of 1842, dated 15th January.) Dr Gibson expresses himself as unfavourable to incurring any expense upon the attempt.

16. At para. 78 a wish is expressed that some more Chinamen convicts may be supplied for the Dapooree Garden; their talent for gardening is well known, and Dr Gibson states that he could provide accommodation (huts) for 20, if so many could be allowed him; and I feel bound to support the suggestion. Dr Gibson's economical administration of the funds and lands at his disposal, alluded to in the 4th and 5th, and in the last paras. of the report, are a guarantee that he will propose nothing ill-considered, nor any measure that is not calculated to advance the general success of his horticultural operations.

17. From his silence on the subject of Mulberry cultivation in the Deccan, I conclude that Dr Gibson's sentiments remain unaltered about standard trees. It is sufficient here to notice the omission. Dr Gibson's zeal and activity in the interesting and important sphere of experiment in which he is engaged, have frequently before now attracted marked commendation; and I trust the progress detailed in the accompanying report will be considered as entitling him to the continued approbation of Government in the highest degree.

I have the honor to be, &c,
(Signed) W. Simson,
Revenue Commissioner.

Poona, Revenue Commissioner's Office,
6th October, 1842.

Report on Government Botanical Gardens, by Surgeon Alexander Gibson, Superintendent.

1. As two and a quarter years have elapsed since I made a report as to the proceedings in this department, I deem it fitting that some account should now be given; the more especially as the accumulation of valuable acquisitions by the overland route has most mate-

rially added to the prospects of utility held out by an institution of this kind. Nearly every overland despatch continues to add something to our store of exotics.

2. I shall first give a detail of agricultural operations as carried on; and, secondly, notice seriatim the various acquisitions interesting to the horticulturist and the botanist.

3. It may be necessary that I should premise by stating, that the gardens under my charge are:—

1st, Dapoorie. 2nd, The subsidiary gardens at Hewra and Neergora. 3rd, The cultivated portions of the Hill Fort of Sewnere, applicable to the rearing of trees which are affected by the heat of the plains.

4. These subsidiary gardens are entirely supported from the garden allowance originally appropriated to Dapoorie alone. The latter has not suffered by the partial reduction of its expences, as produce sales have enabled us to keep establishments on their old footing, if not rather to increase them.

5. The original intention of the subsidiary gardens was, that they should be appropriated solely to agricultural products of a superior class; and this end has been as much as possible kept in view, but owing to the superiority of the Hewra soil over that of Dapoorie for choice trees and shrubs, I have raised many of the most valuable kinds there, as I should probably have lost them had they been planted out in the inferior and dead black soil of Dapoorie.

6. I now proceed to particularise and remark on the several agricultural products. The limited quantity of ground precludes the possibility of making extensive experiments in the various descriptions of exotic cotton.

7. What I have tried since my last report, has not led me to alter my opinion as to these cottons being unsuited to the dry climate and generally shallow soil of our districts in the Western Deccan. The Upland Georgian plant at one time gave promise of success; the plants have generally looked leafy and healthy,—too great luxuriance having been kept down by timely pruning. The cotton formed while the moist climate of the south-west monsoon lasts, is healthy and full blown; but no sooner does this moisture pass away, than the pods shrivel, yield a diseased cotton, discoloured by the ravages of insects on the seed, and in fact good for nothing. The portion cultivated at Dapoorie last year was sown in the only patch of good alluvial soil which exists there; the plants remained stunted and unhealthy, presenting exactly the appearance of those described as having been sown at Broach by the American planters. The soil in which ours was sown was a fine reddish alluvial; the seed was of the most choice description, having been received partly from the Collector of Rutnagherrie, and partly from Dr Royle of the India House.

8. One exception to the general want of success which occurred

with these sowings of Upland cotton, took place in one of two beegas, sown by Mr. Dickinson of the sugar manufactory, the seed having been furnished by me from the sources above mentioned. In the successful beega, about six Deccan maunds of seed-cotton were produced: this, at the rate usual with cotton in this district, will give about $1\frac{1}{2}$ Deccan maunds of cleaned cotton; a fair return but not large, if we consider that the field had the benefit of canal irrigation. The cotton is short in the staple but having healthy seed, and the wool is consequently free from discoloration.

9. The experiment here I do not deem to be one on which a general conclusion could be based, inasmuch as the field enjoyed the shelter of a hedge on one side and tree plantations on other two sides—few of these appliances are to be found in nine-tenths of the villages in the Deccan. The soil in which the cotton was grown was a medium black. Much injury has often been done, and unnecessary expense incurred, by hasty conclusions, drawn from partial premises like those afforded by the above experiment, which I have noticed rather with a view of warning than of encouragement.

10. For example, a person unacquainted with the general features of this country, with the great modification of climate (irrespective of latitude) caused by our north-west wind blowing over such an extent of continent as compared to the sea it has to pass over, *might*, from the result of the above trial, look on the success of American Upland cotton as certain, and recommend it accordingly.

11. While on this subject I will adduce another instance of the danger of these rapid conclusions. Some years ago a gold medal was bestowed by the Agricultural Society of Bombay for the discovery of a cotton thought to be new, long in staple and of superior quality—in fact, identical with the Pernambucco plant.* Now, had

* The circumstance here alluded to occurred before the Editor of the present Transactions was a Member of the Society. The following minute on this part of Dr Gibson's Report was made by Dr J. G. Malcolmson. The best and simplest instrument for frequent observation on the moisture of the atmosphere is a pair of thermometers, wet and dry bulb, fitted up on Newman's plan: they occasion no sort of trouble, and may be had complete for about Rs. 12. Mr Adie recommends two pair of self-registering thermometers, one pair on the ordinary plan, and one pair wet and dry bulb. They require but one reading in twenty-four hours,—the first pair giving the highest and lowest temperature that has occurred, the second the greatest and least degree of moisture. These cost about Rs.23 a pair. Adie's instruments are much the best suited for India of any I have seen. They have a cast iron bracket, zinc scale, and a porcelain (instead of steel) register for the mercurial thermometer. There are large masses of meteorological observations scattered about in the hands of private individuals, in the repositories of the Medical Board, &c., which, if collected together, and published in a systematic form, would be of infinite value to the naturalist, the general statist, the medical man, and the agriculturist. This, unhappily, after all the cost and labour that is required for its original collection, is generally lost to the world from the want of publicity, or

the committee of the Society taken the trouble, in the first instance, to refer to any Botanist, or to any one acquainted with the country, they would at once have been informed,—1stly, That the identical plant has been long ago described by Dr Roxburgh. 2dly, That a plant or two of it is to be found on the premises of most Bramins or Byragees—it being used for a religious purpose—that in such places it has always the advantage of shelter, being close to the house, and that it receives a daily supply of refuse water from the house; and that without these advantages the plant gives no return commensurate with the expense of raising it. 3dly, The Society would have learned that the same plant had been extensively experimented on, between 1828 and 1831, at the Company's cotton farm at Broach, and that the result was a total failure.

12. At present I have been favoured by Mr Elphinston, Collector

from appearing in shreds and patches, scattered throughout the pages of half-a dozen different publications :—

Dr Gibson's Report and the two instructive letters accompanying it, are well deserving a place in the Transactions of this Society, and would add to the value of any work of the kind. Some intimation should, however, be given, that the author is alone responsible for the facts and opinions contained in it, as I cannot help thinking, that Dr Gibson sometimes arrives at conclusions on grounds far from sufficient. This is especially the case when he declares against the possibility of success from the failure of one or more experiments made by himself.

As an example, I may mention, the failure of his experiment with the American Upland Cotton, which is considered as conclusive; yet I have little doubt that the attack of the insects (para. 7) on the pods, was the *cause of their not coming to maturity*, and not the want of vigour of the plants the *cause of the attack of the insects*. The most destructive of these makes its attack more especially on plants grown in gardens, or near trees. The native cotton is not exempt from this, and I saw fields south of Surat, in which half the produce was destroyed or injured. The American plant has this year been ruined by the same insect in the gardens near the town of Broach; but in the open fields few of the pods were damaged. There they seemed to suffer from the dry air, and also perhaps, from the new system of culture. I could not but regret to see the objects of an *experimental* and *model* farm confounded. With regard to the suggestion (para. 17) of Sholapore as a more suitable climate, I would observe, that it is more dry than Hewra, and that the indigenous staple of that district is the *worst* that comes to Bombay,—say 25 times worse than Broach, 15 than Oomrawutty, and 5 to 10 than Comtah or Barsee. With regard to soil, Dr Gibson is mistaken in considering the soil which he somewhat vaguely designates as "red alluvial," to be the same as that mentioned by Dr Wight. The only point of resemblance will be found in the red colour caused by the iron of the subjacent rocks, being in both converted into red oxide. It cannot be supposed that the soil covering the granite of Coimbatoor and derived from, and mixed with, its debris, should be the same as that from the decomposure of the trap rock, or that brought down by the large rivers of the Deccan; but not only are these confounded together, but the soils about Broach are classed with them, part of which are true alluvial soils, rich in lime mixed with sand and clay derived from the granites, traps, and sandstone, of the upper and middle Nerbudda; and another *and important part* is the decomposed subjacent tertiary limestones, clays, mud, and stones, *often also of a deep red colour*. Without attention to such things, the value of experiments is greatly lessened. I do not know that any extensive series of well-conducted meteorological observations have been kept at the two gardens in the Western Deccan, having especial reference to the *moisture of the air*, but these are essential to the objects of the experimental farm being carried out; and I would venture to suggest, that Dr Gibson be furnished with instruments, including rain-guages and two of the least imperfect hygrometers by the Society, or that Government be applied to on the subject. Similar observations should be instituted at Broach; and although there is no experimental garden there, in one or two places in Katiawar. The Secretary should be directed to add a note relative to para. 11, about the gold medal given to Mr Vaupell, on which I think Dr Gibson addressed the Society long since He puts the Society's proceedings in a less favourable light than they deserve; as, at the suggestion of Ball Shastree and myself, the cotton was *not* styled *a new species* as originally proposed. This example, however, and that of the cart and bullocks occasionally given for sugar growing at Hewra, shews the propriety of premiums *for this kind of produce not being voted at general meetings*, except upon a written report by a committee.

June 22. JOHN G. MALCOLMSON.

of Rutnagherrie, with the seed of a Hybrid cotton produced by him after repeated crosses of the Upland with the Sea-island plant. These I will try in as far as my limited means allow.

13. The unwearied perseverance and activity of Mr Elphinston, in the prosecution of these most important experiments, ought surely to entitle him to some mark of public consideration,—especially when we consider that he has carried them on entirely from his private fortune. He has proved that the exotic cottons can be grown in the Conkun red soil; nay, more, that the climate and soil are well suited to their development.

14. The scarcity of water must, however, in all probability, ever present a fatal obstacle to their being cultivated to a profit in that country, and I can by no means concur in the recommendation lately made by the Chamber of Commerce to Government, to establish an experimental cotton farm there.

15. *Country Cotton.*—I have seen no reason to change the opinion I formerly expressed,—viz., that in the Deccan it will only grow well in the too rare and valuable alluvial soils. In February last I saw about 100 beegas which had been sown in black soil, and was then without a blossom. The owner told me that he expended Rupees 700 in hoeing it. Giving him credit for half this outlay, we cannot but applaud his public spirit, however we may demur to his judgment.

16. In adverting to the subject of cotton, it might be interesting to be informed as to the results of the extensive Tuckaree advances for cotton growing, granted, 1st, to Patells of Surat, and Rabory Khoord in Nuggur Zillah, Dec. 1835; 2d, to Lallah Chuttooram, of Sulabutpora, do.; and 3d, to Mr Grant, of Nassick;—one of them at the recommendation of Captain Foster, &c.: whether these advances have had the effect of causing the plant to become a rotation crop in those districts.

17. I beg to be understood as not intending that any of the above remarks should be applied to the Southern Mahratta country, as I am not qualified by experience to speak of it; and the same remark applies to the Sholapoor zillah, which latter is, by all accounts, a much more promising country for cotton than the Western Deccan, and I believe that cotton culture has greatly increased there.

18. *Sugar Cane, Mauritius.*—The increase of this cultivation has, from local causes, been considerable; and the greatest proportion of this increase has been in unirrigated land. This latter branch is one which may yet become of great importance to the country, as close to, and below, the Ghauts are many localities where the cane will grow, and is grown, without irrigation, and this unirrigated cane yields about one-third more extract than the irrigated.

19. Many wells have been repaired and new ones dug; and as Government has been pleased liberally to place at my disposal a sum for the further extension of irrigation, I trust that this most necessary improvement may be carried still further.

20. The Sugar Company adjacent to this place continue to supply the contract for the troops at Poona to a large amount monthly, and the molasses is manufactured on the spot into rum, rum-shrub, and spirits of wine, all of the first quality. Of these the former is supplied (by lease of the annual farms) to some of the surrounding districts, to the exclusion of the too generally deleterious native spirit which often has its strength increased by the admixture of vegetable narcotic poisons.

21. It appears to me that, even in an economical point of view, it is of some importance that facilities should be afforded calculated to lead to the extension of the use of this spirit in preference to that supplied by the up-country liquor contractors. It is worthy to be borne in mind, that the purchase of these liquor farms is, with the sugar manufacturer, not a matter of choice but of necessity, as being the only means of getting rid of his superfluous molasses, of which the quantity is very large.

22. An extension of the principle of the Jooneer liquor farm-grant,—viz., the average of 7 or 10 years (a measure liberally conceded by Government some time ago,) would secure the object in view—probably with eventual benefit to both parties, and with unquestionable benefit to the health of the people around.

23. In regard to the culture of the Mauritius cane in other districts, I have reason to know that the increase has been considerable around and south of Poona—also in the Sholapoor collectorate; and I have remarked several plantations of it at Jageer villages, a pretty good proof that it is cultivated solely on account of its superior value, and not from the wish (so common with the Deccan Ryot) of conciliating the favour, and attracting the notice, of a European official by appearing to be zealous in the introduction of superior products.

24. A good deal of sugar has been made in different parts of the country from the produce of this cane. This has chiefly been the demi-refined, or refined article as made in Hindoostan. This sort is preferred by a good many natives, as they say they are not able to sell the West Indian kind; others again have, on a trial of this plan, regretted having undertaken it, as they say Goor pays them better.

25. There are several strong objections to the likelihood of extension of this Hindostanee process.

1st, The primary outlay, which may amount to rupees 20.

2d, The very great difficulty of procuring refining pots of the requisite shape and smoothness; very few indeed of our potters can attempt them any more than they can a garden flower-pot.

3d, The tediousness of the process. For all these reasons, I have continued, as at first, to make the sugar of the Government's garden on the West India plan, and have now for four seasons found it meet with a ready sale; however, this I could only reckon on in consequence of selling it wholesale to a native who retails it to European customers, for every day's experience confirms (what I had the honour

to state to the late Revenue Commissioner five years ago, in deprecation of an intention which then existed of establishing a Government manufacture of raw sugar)—viz., that natives will not use this description of sugar. Were this raw sugar allowed to enter the English market on West-India duties, *then* there would be a chance of the extension of this description of manufacture, especially in places near the coast; but as the act forbids this until we can supply the wants of our own population, and the said population declines this article, and is also likely to decline manufacturing on any scale of magnitude the demi-refined or charged sugar for their own supply,—I can see no chance save in a modification of the Act to suit local circumstances, of raw sugar becoming a manufacture in situations where there is no local demand: and it strikes me that the Agricultural Society need not hope to extend the manufacture into other districts by their annual donation of a cart and bullocks. From what I can learn, the growth of Mauritius cane in Guzerat and Kandesh has continued to retrograde; this partly from the sudden repeal of the bounty measure in 1838, but perhaps still more owing to those bounties on growth having been originally granted. In stating this opinion, I feel loth to differ with an esteemed friend and patron,—one whose name will be long cherished as one of the most efficient Revenue servants this country ever had; but however unwilling I at first felt to entertain the conviction, it was gradually forced on me by what I saw; viz., that in many situations, and these remote from each other, there seemed in regard to these measures of bounty, a foolish but settled feeling that the Government, in proposing them, did so from a deep-laid scheme of increased future taxation; and this idea was the more confirmed by the fact of cane-plants and cotton-seed being distributed gratis. Now the people here gladly purchase cane-plants for themselves at enhanced rates, even so high as rupees 6 per pand; being upwards of rupees 160 per acre.

26. *Senna, Henbane, and other Medicinal Products.*—Of these, the growth has been rather successful at Hewra; at Dapoorie a failure. Of Senna, the full supply for the medical stores (lbs. 1000) was furnished in March and April last. The species cultivated are the Tinnevelly and Mocha, if, indeed, these be not identical, which I now believe them to be.

27. I was somewhat startled by the leaf produced by one small parcel of seed sent me by Captain G. Yeadell from Aden. The seed appeared identical with the common, but the leaf was rounded. Subsequent importations from Captain Haines produce the true plant. I had on hand a considerable surplus of leaf after supplying the medical stores, but the season was too advanced to admit of its being sent to Bombay: next season I hope to have a surplus sufficient for export. Sold in the bazaars here, it fetches a very poor price, as it is not more appreciated than the imported kind, though the latter consists half of

stalks; but I should think that for the supply of bazaars farther inland, —say to the east of Nuggur, it might be profitably grown, as the carriage of so bulky an article from the coast must be expensive.

28. I have still on hand (after distribution and fresh sowing) about 60 lbs. of the seed of last season, so that I trust Government may see that the trouble taken to procure seed in 1841 has not been in vain. I may here mention that of the Tinnevelly supply, which reached me carefully soldered in tin, not a seed germinated: while that sent by Captain Haines in loose bags, came up well.

29. The Senna crop, I find, requires a sloping, or a light gravelly-soil: it also grows well in reddish alluvial: water settling at the roots destroys it; therefore it should not be sown in beds if sown before November. I sow the first crop in June or July, and cut it down (leaving one small stem) four or five times between that and February. After February-cutting it is hoed, watered, and allowed to seed.

30. *Henbane.*—Of this the supply, Extract and Leaf, continues to be annually furnished to the medical stores. The cultivation is easy, and may be carried into the height of the hot season. It does not grow well in the first three rainy months. As this medicine is, I believe, now considerably used in veterinary practice, I wonder that its cultivation is not more extended to inland stations, where European medicines for horse-practice are expensive.

31. *Colocynth.*—I have not yet been able to raise this plant here in quantity sufficient to enable me to make a tender for supply to the medical stores. Last year my crop of the plant was destroyed by the porcupines, but I continue spreading the plant, seed of which I originally brought from the eastern Deccan, as it is not indigenous here, though the *C. pseudo Colocynth* is common. I rather wonder that the manufacture of the extract has not been permanently followed up by some person resident at Surat, in conformity to the hint I gave in the memoir which Government did me the honour to have lithographed in 1836. The plant is most abundant on the sea-shores there, and the other requisites for the compound-extract are to be had abundant and cheap in the drug-shops of that city. In the memoir in question, I pointed out the fact, which was afterwards disputed but subsequently confirmed, that this species is the true Colocynth. In Mr Graham's list it appears as the *C. Hippo Colocynth.* The comparison of a specimen of leaf sent me by Dr Burn, decided the point at once. When it is considered that the compound-extract costs L.1, 1s. per lb., and that a large quantity is annually consumed, it must be allowed that the subject is important.

32. *Elaterium.*—The seed of this active and expensive medicine has been sent me from the India House. One plant has survived, as has one of three seeds previously given me by Dr Lush. The plants repeatedly died down; at last (I am happy to say) I have one in fruit, which promises to mature.

33. *Foxglove.*—Many plants raised from seed sent by Dr Royle, have been from the first sickly, and give as yet (18 months) no promise of vigour.

34. *Hemlock.*—Seed from the same source. Puny rather than sickly—may yet do. Plants put out close to a running stream have perished.

35. *Calumba Root.*—I am not aware that this valuable exotic has ever yet been introduced into the Bombay presidency. Some roots have been commissioned from Mosambique for me, by the active exertions of Furdonjee Murzbanjee Mobed, of Damaun, a zealous cultivator of Medical Science; and as I was informed that the plants had arrived alive, I have reason to hope that they are now on their way here.

36. Of Indigenous Medicinal Plants, possessing valuable qualities, we have in the gardens, Lemon Grass, Pomegranate, Golmicha, Cosalpo Bondei, Truposantues Amas, Byronia Epygea, Trichosanth Laim, Pent-aptua Arjun, Bignonia Indica, Cassia Fistula, Indigofera 3 sh., Sephrosia, &c. &c., Mucuna Prurita, &c. &c. For most of these, we have occasional applications from natives for use in sickness. These applications are always complied with.

37. *Cereal Grains.*—Of these the cultivation is as much as possible limited to those necessary for crop rotation. Of the celebrated Vittoria Wheat of Carraccas, about which so much has been written and said, I received a fresh supply last season, by the kindness of the indefatigable Mr. White, of Plymouth. I sowed it; but found it, as on the former trial, not superior in quantity of return, and decidedly inferior in colour and quality, to even our medium wheats in this country. It does not ripen a day sooner than our Indian kinds. It may be a valuable grain in Carraccas or the West Indies, where I fancy there is no great choice of Cereals; but to us who possess such a variety, it is of no account. Of the Rye and Oats, liberally supplied from the India House last season, I did not find the growth successful—the former did not even ear, and the oats were much inferior to the acclimatized oat sent from Bengal: even the latter, as I think I mentioned in my last report, I found to be too husky to be given to animals, as it caused a chronic cough. I have, therefore, discontinued the growth of the grain. I have this season received from the India House, a supply of wheats of various and choice descriptions; and I have also commissioned from Messrs. Lawson and Sons, Edinburgh, *men* eminently successful and skilful in the choice of agricultural products of the best kind, a farther supply. These I hope to receive by next mail, in time for the sowing of the season.

38. *Potatoe.*—The growth continues to extend; and this year the April crop afforded about 1,000 bullock loads from the villages in the vicinity of Jooneer, westward.

My expectations have been answered as to these villages being most

favourably situated for the supply of the Bombay market, as this affords the chief outlet. The Neilgherry seed appears not to degenerate at Neergora, as it does in most other places. This season the cultivation has extended to a good many villages at the head of the ghauts.

This I have not verified from personal experience yet, but from the information of others, and also from having seen the ghat people employed in ransacking the emptied fields at Neergora and Belsur, for potatoes left after digging.

39. That the cultivation is bona fide considerably extending, I further judge from the fact of the demand for seed potatoes being great. In June I gave out considerable quantities, on condition of receiving an increased quantity on the ripening of the crop.

The public have complained, and I believe with reason, that the large potatoes grown in this district, are liable to the same objection in the crop of the hot season, as those at Mahabuleshwur, viz. the liability to spoil. This liability increases with the heat, so that this year the loss was even greater than usual. For this we now find that the most effectual remedy is, to store the roots for 20 days after digging, instead of sending them off immediately as heretofore. Within that time the unripe ones get discoloured and are removed. The remainder can be kept for months. We did not ascertain the value of, and necessity for, this precaution, till too late this season. In future it shall be acted on in as far as my influence extends.

40. An additional precaution is, that all the roots having irregular knobs and prominences, should be rejected for export, as these prominences are adventitious growths, being young potatoes stuck on to the body of the old one, and affect the keeping of the whole.

41. The above hints may seem tedious, but will be found useful. The crop with us is a biennial one, viz., in October and in April.

Those of the rains crop succeed best in black soil, the others in the reddish alluvial.

42. *Tapioca.*—This product has made no way among the people, nor was it to be expected that in a great bread-corn country like this, a crop which takes a year to ripen for flour, could ever do so. As a mere esculent for roasting to be eaten on fast-days, I thought it had a chance of success, but as yet I find that the sweet potato, and the common potato, are preferred to it. For the Konkuns it might be of more consequence, seeing that rice is the staple there; but since the transit-duties abolition, bread-corn is now supplied so cheaply from the interior, that no person would find it worth his while to cultivate a crop so tedious in ripening, when he can purchase good imported wheat at the rate of less than one anna for two lbs.

43. I find (*vide Medical Topography of Dacca*) that forty years ago the root was introduced there in the hope that it would prove a staff of life to the numerous population of that city, but the experiment did not succeed. The preparation of tapioca from the root as an ex-

port for medicinal and culinary purposes in England, has attracted some attention in Calcutta, but this can hardly form an appreciable item in the resources of a great country like India.

44. *Indian Corn*—Should have been noticed among the Cerealea. That brought out by the American planters, seemed hardly superior to our indigenous product. It is now under increase. A quantity received from the India House, per the June steamer, was sown, and will ripen in three weeks. The varieties sent were the most splendid, as to size and colour, which I have ever seen. Should they not degenerate, they will be found well worthy of extensive distribution, and will, I have not the least doubt, be eagerly sought after.

45. *Arnatto.*—This dye seed, the produce of the Bixa orellana, grows well with us. I had not anticipated any indigenous market for it, but last season it was eagerly bought up, at lbs. three per rupee, by dealers from Poonah. I do not know the probable extent of the demand, but mean to increase the cultivation in order to meet it.

The tree, I believe, grows well in the Carnatic provinces, but is hardly known here.

46. *Madder.*—We find that this plant grows even with weedy luxuriance, but I have not yet gathered a sufficient quantity of the root to submit it for judgment in Bombay. From appearance I would judge that it may be found deficient in colouring matter as compared with the root of the Mediterranean.

47. We have a wild species (Rubia Cordifolia) common on the very high hills, as Hurrychunder and Mahabuleshwur. Its root also affords colour.

48. *Tobacco*—Has been grown pretty extensively from choice Syrian seed. The quality of the prepared leaf has been, by judges in Bombay, pronounced inferior; but with every respect for this authority, I deem it in flavour quite equal to the best Persian.

Another trial will be made this season by manuring the ground in order to increase the strength of the flavour.

49. *Coffee.*—I have on three occasions been liberally supplied with coffee seed by Government. Further supplies will not be required, as I now raise plants in abundance from seed produced in the garden at Hewra.

At Dapoorie this tree (like many others) will not produce fruit.

I have at present about three hundred young plants here nearly ready for distribution.

The produce of the five year old trees is not any thing very encouraging as to quantity, though as to quality first-rate.

50. I deem it hopeless to expect that our irrigated and artificially shaded coffee trees can ever produce an artiele qualified to compete with that of countries having their area as yet consisting chiefly of uncleared virgin soil, and, moreover, it is demonstratively true that the prices of coffee must, owing to daily extending competition not

met by equally extending consumption, fall to a very great extent. Should a change of habits on the part of our population beget an extension of tastes, and among them a taste for coffee, there is no reason why in many villages the tree might not become a common and ornamental appendage to the cottagers' dwellings; and in *this point of view*, it may be worth while to keep up the cultivation of the tree.

A joint stock company, were it to engage in the cultivation, would do so with the certainty of loss.

51. *Tea.*—This first experiment made with tea in the Deccan, turned out (as might have been expected) a complete failure.

52. Lately we have been favoured by Government with an importation of the Assam Tea Plant, of which forty-three reached us alive.

53. It does not appear to me that we have either analogy or experience as a ground for hope that the plant will suit the climate of the open plains of the Deccan, though in some few localities it may be *preserved alive*; neither do I see that we gain much by attempting (at an undoubted expense) to naturalize, within our own presidency, the growth of a production which we can always have from Bengal or China at reasonable rates in the natural exchange of commodities.

54. If the plant will succeed anywhere within our limits, it will probably be in valleys above and close to the Ghats, in places well sheltered from the violence of the S.W. monsoon. At Mahabuleshwur I was pleased to observe in May last that the tea plants, though showing no exuberance of leaf likely to reward the merchant, had yet grown to the height of above 3½ feet. These have been planted, I think, about 9 years in what was the station garden (now a potatoe ground) completely sheltered from the S. W. wind, but having the vale open to the rivers and streams in the lower dells, so that throughout the year they must enjoy a moist climate.

55. Localities in Kandesh, about the Nerbudda, and other places, have been suggested as eligible places for exotics; but the heat in all those places in the hot season is very considerably greater than that of the Deccan, so that tea plants could have no chance there. I cannot say if the climate, so high up as Omercunthe, might be more eligible, as I have not sufficient local knowledge to offer an opinion.

56. *Grass Seeds.*—Quantities of grass seed, of varied and choice descriptions, have been supplied to us from the India House, in the view of their increasing the supply of food for cattle. Of these a large portion has been sent to Mahabuleshwur for trial there. In the open country I do not see a chance that they can be raised or kept alive without artificial irrigation, so that their extension on mountain and barren lands in this latitude I hold to be physically impossible; while in the better class of soils of the Deccan and Guzerat we have abundance of fine natural grasses, besides the large quantity which is artificially raised in the hot season, as food for cattle. This consists

of nullett and Indian corn as thickly sown as possible, in order to secure a long and succulent stalk at the expense of the ear.

57. It is a standing crop in all well-circumstanced villages, and without it the cattle must, and do, perish in great numbers in any season where the rains are, as in the present year, late in commencing. It has in many instances this year sold so high as rupees 100 per beega, the common price in a good one being from 20 to 50 rupees.

58. *Guinea Grass.*—This is, I believe, the staple food for cattle in the West Indies, where it is grown without irrigation on the hills, &c. In this climate it does not at all succeed without irrigation.

59. I have tried it on the hills near streams, and found it a failure. Many parts of the Concan might suit : I mean those low moist spots which the eye can detect even in the hot season.

60. *Lucerne.*—The Kelat lucern, of which a large quantity was furnished by Government six months ago, has been partly sown and partly distributed. It has vegetated well, but I fail to detect the smallest difference between it and our Deccan species. Its superior luxuriance at Kelat, &c., must be owing to climate rather than to species.

61. *Vegetable Seeds.*—Of these a variety of supplies have, at different times, been forwarded from the India House; among them are many new and valuable kinds. The Russian cucumber, lately received, promises to be a very valuable addition to our list of esculents, from its being so very prolific. It may now be seen in full growth at Hewra. The varieties of peas and beans also are of great promise.

62. *Fruit Trees and Ornamental Shrubs and Plants.*—Of these, we have been able to add very considerably to those already in the Gardens, chiefly through the liberality of Messrs Loddiger & Co., of Hackney, and the indefatigable exertions of Colonel G. R. Jervis, Bombay Engineers, who, while in England, lost not a single opportunity of forwarding plants free of expense. In this way dispatches of trees, which in carriage alone must, had they not come by private hands, have cost several hundred pounds, have been conveyed to the Gardens for the mere charge of bringing them from Bombay.

63. Among these I may enumerate—1st, the Olive of three species; the broad leaved, the redoute, and box-leaved—of the two latter many have been planted out, and at Hewra is one 10 feet high. At the latter place they are all most flourishing; at Dapoorie somewhat poor from quality of soil, I believe I will have to transfer them. 2d, Cedar, one tree, flourishing; 3d, Kye apple, flourishing; 4th, Zezephus Bonariensis, ditto; 5th, Arancarias, 3 species, ditto; 6th, Fuchsias, 4 species, sickly; 7th, Camellias, 5 ditto, healthy; 8th, Magnolias, 5 ditto, sickly; 7th, Anona Cherinulya, 1, tender; 8th, Star apple, 1, strong and healthy; 9th, Mahogany, 1, healthy; besides a variety of smaller plants and bulbs, many Cactuses, the blood red Malta Orange,

several flourishing trees, and about 40 species of rare Orchideous Epidendia from the dense forests of Demerara, Surinam, &c.

64. To Dr. Royle we also are indebted for various trees from Brazilian and American seed, names not yet ascertained, as the packets had no superscription; also for Gleditschia Triacanthos, 2 Philadelphey, numerous seedling Cypress trees of 3 species, a maple, many pines, &c. &c.; and a great number of the beautiful annuals of California, Rhododendra, of which supplies have frequently been sent, have uniformly died off after vegetation; the same fate has attended cuttings of fruit trees also sent by Dr. R.

65. To this source also are we indebted for the Tansy, and for the Hop, which, however, is too sickly to allow a thought of its flourishing in this latitude I have one plant, a seedling.

66. To Dr. Wallich we owe the Prinsepia Utilis, and some other valuable trees.

67. To Dr. Falconer, Seharunpore, several valuable forest trees, new to this presidency.

68. To Dr. Lush many flourishing trees of Schinus Molle, a medicinal tree of South America. To the late Dr. Heddle, the Voincinia Regia. To Mr Nemmo, a most valuable tree, the Sennaar Ebony.

69. The seeds of the Himaleh Walnut, forwarded by Government 2 years ago, are now (many of them) flourishing young trees.

70. The Abyssinian seeds very lately forwarded by Government, have already vegetated, and it is likely that we may get from them some forms of vegetable life new to science.

71. With respect to the importation of valuable exotic trees, which we receive in exchange for plants sent from this country, it is to be lamented that so much uncertainty should prevail in the Post Office arrangements as to forwarding parcels from this country. One package, franked by Government, as per Mr. Boyd's letter, No. 2866 of 1838, was charged postage upwards of £104. The person to whom it was addressed, had the greatest difficulty in getting over £100 of the charge. The remaining £4 he could not get relieved from.

71. One package, a case containing most valuable plants for Messrs Loddiger & Co., respecting which a reference was made to Government in July or August 1841, and which was finally forwarded by Captain Oliver, Superintendent of Indian Navy, per steamer of September 1st, never reached its destination at all, having probably attracted the attention of some *amateur* on its route.

73. One small box of very rare Indian plants, the conveyance of which was kindly undertaken by two private friends, passengers—reached London, charged with a postage of £18 18s., and was of course refused. I mention these things as illustrations of the difficulties which beset us in efficiently carrying out the great measure of an active interchange of the productions of this country for those of Europe and America.

74. *Indigenous Timber and Forest Trees.*—We have gone on annually increasing the variety of these, both with the view of concentrating under the eye of the scientific traveller who may happen to visit this country, the varied forms of our forests, and of testing the value of different trees, as to rapidity of growth, value of the wood, medicinal properties, or other useful qualities; and thirdly, with the view of forming a depot, from which trees or tree seeds, warranted ripe and fresh, can be distributed to different parts of the country.

75. Several gentlemen have materially forwarded this object by collecting and sending annual supplies of seeds. It were to be wished that the spirit of sending occasional contributions were more general throughout the services.

76. Natives not unfrequently ask for trees to be planted near their wells; but as yet these demands have been confined to Teak, Oranges, Cypress, and Guavas; and of Shrubs, to the Red and White Rose, and to the Annoto tree seed.

77. The Indian-Rubber Fig has been largely increased here, as several natives have expressed a wish to have trees of it, from the beauty of its leaf and its affinity to their own war-tree Ficus Indica.

78. I mentioned above, that trees for which the air of the plains is found not to be suited, are removed by me to the Hill Fort of Sewnere. By the labour of the four Chinamen (convicts) furnished to me in January last by order of Government, the hill is assuming quite a new aspect, and the vegetable gardens, which I have allowed them to form for themselves, are, as is usually the case with the works of this people, models of neatness. I could wish that we had twenty such men employed at Dapoorie; I would undertake to hut them, and to pay the expense of guarding them from the Garden funds. They would do much to set an example of neat and careful gardening—an art which none of the Deccan people are up to,—while, by the plan I propose, no extra expense would be incurred.

79. While on the subject of trees, I may mention the Ceratoria siliqua, or St John's Bread, respecting which, viz., the possibility of diffusing it extensively over the country, a reference was some time ago made to me by Government. Since then, I have carefully watched the growth and habit of those trees in the garden here, and in respect of neither of these is the result encouraging. They appear to require shelter and constant care. In as far, then, as I yet see, I have no reason to recommend that expense be incurred for its extension. In relation to this subject generally, I observed lately in the *Bombay Times* an article, calling the attention of Government and of the public in general, to the practicability of introducing European timber to supply the place of native woods in house-building, &c.* The writer could not

* Dr Gibson must have entirely forgotten the drift of the article in question —which appeared in the *Bombay Times* of July 27, 1842. It contains not the

have been aware that in this country we have a vast variety of woods differing in hardness, durability, and value, and that most of these woods are applied for building purposes, according to the means of the builder; neither could he have been aware how peculiarly perishable the best Pine timber is in this climate, nor how very delicate, stunted, and sickly, Fir trees of all sorts continue in this latitude. I only notice the subject now, as it may save me the necessity of answering a reference hereafter; though I confess I do not deem it probable that Government could ever sanction a plan so certainly expensive, and so little likely to be satisfactory in its results. I am very far from wishing, by the above remarks, to be understood as wishing to damp any efforts which may be made to introduce new trees, and thus increasing the variety of our vegetable world, and more especially those which have useful properties.

80. *Oil-Plants, &c.*—On this head I may remark, that the Madia sativa, of which seeds were brought out by Dr Lush, has been extensively tried both at Hewra and at Dapoorie, as a rains-crop, as well as a crop of the cold season.

It does not appear to suit this climate. While beginning to flower, a great part of the plant becomes blighted and dead. This affects so materially both the quantity and the quality of the seed, that I do not conceive it likely ever to afford a remunerating return, or even to repay the expenses of its cultivation; but we have an indigenous edible oil, probably quite as good, viz., that of the Arachis hypogda or Ground nut, which oil, I am happy to see, is most favourably noticed in the Bengal Dispensatory, p. 304. This oil I can, from experience recommend as a salad oil, very superior to the Olive oil commonly sold in this country, and quite equal to the Oil of Poppy-seed; but of this oil I trust to have more to say by and bye, as the oil-press on Bramah's principle, lately set up here, is not yet in full work,—a first trial having only been made some days ago, and that with castor-oil seed.

As far as I have yet seen, the promise of its perfect efficiency is very

slightest allusion to the introduction of European timber into India, much less does it say any thing about the preferableness of pine as applicable here to building purposes. The object of the writer apparently is to show, that were experiments made in Western India on the growth of exotic forest trees from any part of the world, it was probable that timber more economical in house building might be found than that presently in use. The only allusion to pine, or to the woods of Europe at all, is given by way of illustration—to show that if certain ends of much importance have been attained elsewhere, certain other ends worthy of being sought after might probably be found attainable at Bombay. Dr Gibson in writing, most likely without referring to the article, had probably retained on his mind an erroneous impression of the drift of the following remarks:—"The best illustration that presents itself on the present subject is the introduction of Larch trees from Switzerland into Great Britain. About a century since they were brought as flowering shrubs to Monzie and Dunkeld, in Perthshire, &c."—Editor Agri.-Hort. Society's Transactions.

favourable; but I hope shortly to submit (according to order) a detailed report of results with different seeds.

81. *Buildings, Establishments, &c.*—Since last report two plant houses, intended for valuable exotics, have been built on a substantial scale,—one at Dapoorie and one at Hewra;—various other improvements have been made, calculated to increase the efficiency of the gardens; and further enlargement of garden offices, is at present in progress, as an increase of store-rooms is urgently required. These measures, however, have caused no extra charge to be made on Government, nor will they do so, as the whole is defrayed by the proceeds of the gardens. I should also mention, that of the land made over to me by Government in 1838 for garden purposes,—viz. the Government land at Belsur,—I have reserved only a small portion for garden use, and made the remainder over to the Collector's Department for rent by auction sale, as before; and that, owing to the increased value which circumstances have given to the land at this place, the last sale realized Rupees 107 for about 4½ acres, on a three years' lease, making the amount (inclusive of Mr Dickinson's holding) Rupees 122 per annum, and the annual payment per acre nearly Rupees 24; while the adjacent meeras land of equal quality pays an assessment of about Rupees 3½ per acre.

My reason for again making over this larger portion to the Revenue department was, its being unfitted, owing to liability of river-overflow, for the growth of trees: and moreover, I felt desirous of ascertaining whether the extended cultivation of the potatoe and sugar-cane at that village had affected the value of land.

(Signed) ALEX. GIBSON,
Superintendent Botanical Garden.

GOVERNMENT GARDEN, HEWRA,
13*th August*, 1842.

To D. BLANE, Esq., Revenue Commissioner, Southern Division,

SIR,—I am directed by the Honorable the Governor in Council to acknowledge the receipt of Mr Simson's letter, No. 1432, dated the 6th October last, handing up Dr Gibson's report on the progress of the Gardens under his superintendence, and of his Horticultural operations generally for the last two years.

2. The Honorable the Governor in Council considers Dr Gibson's report an interesting and valuable record of operations, which have in view the promotion of agricultural improvements, and the introduction of superior articles of cultivation, by the simple and effectual mode of demonstrating their practicability, and affording to individual enterprize facilities for their adoption. Considering the position and character of the Native Ryot, it is not to be expected that the influence of such operations will be immediately perceptible. There is, however,

every reason to hope, that they will eventually produce the desired effect; and as the object is, by rendering the industry of the cultivating classes more profitable, to raise their condition, and to augment the resources of the country, it is the duty as well as interest of Government to persevere in the effort, and to aid and encourage the agents employed, by every means in its power.

3. The failure of the experiments with exotic cottons, (except in one instance under peculiarly favourable circumstances,) and Dr Gibson's observations on country cotton, tend to confirm the impression now generally entertained, of the unsuitableness of the districts of the Western Deccan for this cultivation.

4. The Governor in Council expects soon to learn, and considers it therefore unnecessary to speculate on, the result of Mr Elphinston's further experiments in the Rutnagherrie Collectorate, which will throw light on the question, whether cotton can be grown there at a profit. If this point be determined in the affirmative, a most valuable benefit will be conferred on the country.

5. The Collectors of Ahmednuggur and Candeish have been called upon to report whether the large Tukaree advances to the parties named in paragraph 16 of Dr Gibson's report for cotton growing, have had the effect of causing the plant to become a rotation crop.

6. The increase of Mauritius sugar-cane cultivation is, on the whole, satisfactory. Extracts of the paragraphs on this subject (paragraphs 18, 19, and 23 at 25 of Dr Gibson's Report. Paragraph 5 of the Revenue Commissioner's letter, handing up the foregoing) have been communicated to the principal Collector of Surat, and the Collectors of Poona and Sholapoor.

7. The ease with which the juice of the cane is converted into goor, the extent to which this article enters into the consumption of the mass of the native population, and the ready sale which it commands on the spot, at remunerating prices, will naturally prevent the adoption of a more difficult and expensive process by which the juice may be converted into sugar. Indeed, the policy may be doubted of encouraging the ryots to exchange the manufacture of goor for that of sugar, especially on the West India plan, for which the market is precarious, at least for a time, or until the certain, though small, profit at present derived, shall have led to a wider extension of the cane cultivation. This may be checked by difficulties or losses in the production of sugar, or in its disposal, but when the supply of goor becomes superabundant, a change in the manufactured article may gradually take place under a healthy impulse to adapt it to demands in other places. Neither should the circumstance be overlooked that, under the present state of things, a great number of the poorer classes, from the cheapness of goor, are enabled to procure a nutritious article of diet, and a comfort which, were the juice of the cane generally converted into sugar, would in this form be beyond their means.

8. The Governor in Council has no doubt of the desirableness of substituting, for the liquor supplied by the native contractor, the spirit manufactured at Hewra by Mr Dickinson, which Dr Gibson considers a preferable article, as being free from noxious ingredients. But the supply of spirits to the people at a cheaper rate than at present is not to be desired. This would encourage, while it is the object of Government to check, the use of intoxicating liquors, and the vice of drunkenness. If benefit has resulted from the Sewnere liquor-farm having been given to Mr Dickinson, which you are requested to ascertain and report, Government will be prepared to sanction an extension of the system, on your submitting any specific propositions on the subject.

9. It is unnecessary to discuss the question of bounties (alluded to in Dr Gibson's 16th para.)—the encouragement so held out having been long since withdrawn, and not now existing anywhere in this presidency.

10. The Medical Board has been furnished with extracts from your predecessor's letter under reply, and from Dr Gibson's report, relative to the cultivation of Senna, Henbane, and other medicinal plants, which have engaged Dr Gibson's attention. (Paras. 8 and 26 to 36.)

11. Dr Gibson's remarks in para. 31, regarding the Colocynth plant, have been communicated to the principal collector of Surat.

12. The report on Cereal grains, Potatoe, Indian Corn, Tobacco, and the Tea plant, &c., calls for no particular remark.

13. Though the experiments with the Coffee Plant, the Governor in Council observes, have not been attended with any encouraging result, yet they should not be abandoned, and Dr Gibson should avail himself of every opportunity of distributing plants gratis to villagers in different districts. His Honour in Council understands that Coffee has been raised in Messrs Sundt and Webb's estate at Moondwa, near Poona, of very fair quality.

14. The attempts to introduce foreign grasses appear to have been in most cases unsuccessful; but the account given of vegetable seeds and fruit trees is very promising.

15. Paras. 74 to 76 of Dr Gibson's report show that considerable progress has been made in the important object of adding to the number and variety of useful timber and forest trees, and the Governor in Council trusts it will be still further advanced by the measures suggested in my letter to your predecessor, No. 82, dated 15th January, 1842.

16. Dr Gibson's application to be allowed the aid of some more Chinamen (convicts) will be considered and disposed of in the Judicial Department.

17. You are requested to inform Dr Gibson, that the Governor in Council awaits his report (promised in the 80th paragraph) on the working of the oil-press from England.

18. The return to the Collector's Department of the portion of land, alluded to in the 81st paragraph of Dr Gibson's report, is approved.

19. You are instructed to convey to Dr Gibson the high commendations of Government, for the zeal and ability with which he has prosecuted the various operations connected with his important duties, as also the thanks of the Governor in Council, for the clear and interesting account he has furnished of his proceedings.

20. A copy of your predecessor's letter, with Dr Gibson's report, and of this communication, I am directed to add, has been furnished to the Agri-Horticultural Society.

I have the honour to be,
SIR,
Your most obedient servant,
(Signed) L. R. REID, *Chief Secretary.*

BOMBAY CASTLE, 13*th June*, 1843.

CULTIVATION OF NUTMEGS AND CLOVES.

[From the *Penang Gazette*, February 25, 1843.]

THE mode of culture adopted in the different plantations is nearly the same. The beds of the trees are kept free from grass and noxious weeds by the hoe, and the plough is occasionally run along the interjacent spaces for the purpose of eradicating the Lallang (Andropogon caricosum) which proves greatly obstructive to the operations of agriculture. The trees are generally manured with cow dung and burnt earth once a year in the rainy season, but the preparation of suitable composts and their mode of application are but imperfectly understood. The pruning knife is too sparingly used; very few of the planters lop off the lower verticles of the Nutmeg trees or thin them of the unproductive and straggling branches.

The site of a plantation is an object of primary importance, and doubtless the alluvial grounds are entitled to preference from the acknowledged fertility of their soil, and its appropriate organization and capability of retaining moisture, independent of the advantage of water carriage. Several of the Nutmeg trees of the importation of 1798 at Moco Moco, are placed in soil of this description; although never manured they are in the highest state of luxuriance and bear abundantly; and I have been informed by a gentleman recently arrived from that Station, that the stem of one of them measures 38 inches in circumference. Some of the trees in my own experimental garden corroborate the truth of this assertion; one of these blossomed at the early age of two years ten months and a half, a degree of precocity ascribable solely to its proximity to the lake which forms the southern boundary. This was the first tree that blossomed of the importation of 1803, which consisted of upwards of 22,000 Nutmeg plants. Next to the alluvial deposits, virgin forest lands claim pre-eminence, their surface being clothed with a dark-colored carbonized mould formed by the slow decay of falling leaves and mouldering trunks of trees; and next to these are to be ranked the open plains.

Declivities are objectionable from the risk of the precipitation of the mould and manure into the subjacent ravines by the heavy torrents of rain that occasionally deluge the country. Above all, the plantation must be protected from the Southerly and Northerly winds by a skirting of lofty trees, and if nature has not already made this provision, no time should be lost in belting the grounds with a double row of the Cassuarina littorea and Cerbera manghas, which are well adapted for this purpose. This precautionary measure will not only secure the planter against eventual loss from the falling off of the blossom and young fruit in heavy gales, but will prevent the up-rooting of the trees, a contingency to which they are liable from the slender hold their roots have of the soil. If the plantation is extensive, subsidiary rows of these trees may be planted at convenient distances. No large trees whatever should be suffered to grow among the Spice trees, for these exclude the vivifying rays of the sun and arrest the descent of the salutary night dews, both of which are essential to the quality and quantity of the produce. They further rob the soil of its fecundity, and intermingle their roots with those of the Spice trees. It is true that by the protection they afford, they prevent frequently the premature bursting of the husk occasioned by the sudden action of a hot sun upon it when saturated with ruin; but the loss sustained in this way is not equal to the damage the Spice trees suffer from these intruders. Extensive tracts of land are to be met with in the interior of the country well adapted for the cultivation of the Nutmegs and Cloves, and to these undoubted preference is due.

In originating a Nutmeg plantation, the first care of the cultivator is to select ripe Nuts and to set them at the distance of a foot apart in a rich soil, merely covering them very lightly with mould. They are to be protected from the heat of the sun, occasionally weeded, and watered in dry weather every other day. The seedlings may be expected to appear in from 30 to 60 days; and when four feet high, the healthiest and most luxuriant, consisting of 3 or 4 verticles, are to be removed in the commencement of the rains to the plantation previously cleared of trees and underwood by burning and grubbing up their roots, and placed in holes dug for their reception at the distance of 80 feet from each other, screening them from the heat of the sun and violence of the winds. It is a matter of essential importance that the ground be well opened and its cohesion broken, in order to admit of the free expansion of the roots of the tender plants, and that it be intimately mixed with burnt earth and cow manure, in the proportion of two thirds of the former to one third of the latter. The plants are to be set in rows as well for the sake of regularity, as for the more convenient traversing of the plough, which is now to be employed in clearing the intermediate spaces of Lallang and other noxious grasses, carefully avoiding to trespass on the beds of the trees. They must be watered every other day in sultry weather, manured annually during the rains with four garden baskets full of the above mentioned compost to each tree, and protected from the sun until they attain the age of five years. They will now be sufficiently hardy to bear the sun, and from that age until their fifteenth year, the compost should consist of equal parts of cow-dung and burnt earth, and from 8 to 12 baskets full will be required for each bearing tree; a lesser proportion being distributed to the males. From the power of habit the trees will after the 15th year require a more stimulating nutriment; the dung ought not therefore to be more than two or three months old, and the mixture should consist of two parts of it to one of burnt earth, of which the suitable proportion will be from 12 to 16

baskets to each tree biennially. In all cases the prepared compost must be spread out in the sun for three or four days previously to its application, in order to destroy grubs and worms that may have lodged in it, and which might injure the roots of the plants.

In all plantations, whether situated in forest land or in the plains, the necessity of manuring at stated intervals has been found indispensable, and is indeed identified with their prosperity. The proper mode of applying it is in a circular furrow in immediate contact with the extremities of the fibrous roots which may be called the absorbents of the plant. Where there is a scarcity of dung, recourse may be had to the dregs remaining after the preparation of the oil from the fruit of the Arachis Hypogoea, which, in mixture with burnt earth, is a very stimulating manure; or composts may be formed from the decomposition of leaves or vegetable matter of any description. A very fertilizing and highly animalized liquid nutriment for plants is obtained by macerating human ordure in water in proper pits for four or five months, and applying the fluid to the radical absorbents of the plants. Sea weeds and many other articles may also be resorted to, which will readily occur to the intelligent agriculturist.

During the progressive growth of the plantation, the beds of the trees are to be regularly weeded and the roots kept properly covered with the mould, for these have a constant tendency to seek the surface; the growth of the lateral branches alone is to be encouraged, and all suckers or dead and unproductive branches are to be removed by the pruning knife, so as to thin the trees considerably and to admit of the descent of the night dews, which are greatly contributive to their well being, especially during the dry and sultry weather; creepers are to be dislodged, and the lower verticles lopped off, with the view of establishing an unimpeded circulation of air. The conclusion of the great annual harvest is the fittest time for pruning the trees. After the eradication of the Lallang, the growth of innoxious grasses is to be encouraged in the intervals between the trees, which will give the plantation the appearance of a park, and the plough is now to be abandoned.

The Nutmeg tree is monoecious as well as dioecious, but no means of discovering the sexes before the period of inflorescence are yet known. The relative proportion of male and female trees to each other is also undefined, and is indeed the result of chance. Setting aside, however, all pretensions to mathematical precision, the number of productive trees may be roundly estimated at two thirds of the whole cultivation. However presumptuous it may appear to arraign the operations of nature, I cannot but think that, with reference to the genus Myristica, she has made a most unnecessary provision in the creation of so many male trees, since the moecious plants are fully as susceptible of the rapturous impulse of connubial bliss, and equally competent for the purposes of ardent and successful love. The number of male trees therefore necessary to be retained will depend entirely on that of the monoecious kind; all above this number, being considered as superfluous, should be cut down, and other trees planted in their stead. Were I indeed to originate a Nutmeg plantation now, I should either attempt to procure grafts on male stocks on such trees as produce the largest and best fruit, by the process of inarching, notwithstanding the speculative hypothesis of the graft partaking of the gradual and progressive decay of the parent tree, leaving a branch or two of the stock for the purpose of establishing a regular polygamy, by which means the plantation would consist of monoecious trees only; or I should place the young plants in the

nursery at the distance of four feet from each other, and force them to an early discovery of their sex, by lifting them out of their beds once a year and replacing them in the same spot so as to check the growth of wood and viviparous branches. The sex might thus be ascertained on an average within the fourth year, and the trees removed to the plantation and systematically arranged, whereas in the usual mode of proceeding it is not ascertainable before the seventh year in general.

Upon an average, the Nutmeg tree fruits at the age of 7 years, and increases in produce till the 15th year, when it is at its greatest productiveness. It is said to continue prolific for 60 or 80 years in the Moluccas, but our experience carries us no farther than 22 years and a half, all the trees of which age that have been properly managed, are still in the highest degree of vigour and fecundity; and for this reason no term for planting a succession of trees can as yet be fixed upon. Seven months in general elapse between the appearance of the blossom and ripening of the fruit, and the produce of one bearing tree with another under good cultivation may, in the fifteenth year of the plantation, be calculated at five pounds of Nutmegs, and a pound and a quarter of Mace. I have observed however that some trees produce every year a great quantity of fruit, whilst others constantly give very little. It bears all the year round, but more plentifully in some months than in others. The great harvest may generally be looked for in the months of Septemner, October, November and December, and a small one in April, May and June. Like other fruit trees on this portion of Sumatra, I have remarked that it yields most abundantly every other year. The fruit having ripened, the outer integument bursts spontaneously, and is gathered by means of a hook attached to a long stick, and the Mace being cautiously stripped off, and flattened by the hands in single layers, is placed on mats for 3 or 4 days in the sun to dry. Some planters cut off the heels and dry the Mace in double blades, from an opinion that the insect is apt to breed in or about the heels, and that the double blade gives a better and more substantial appearance to the Mace. The former idea is entirely groundless, for if the article be properly cured, kept in tight packages, in a dry situation and exposed to the sun for 5 or 6 hours once a fortnight, there need be no apprehension of the insect; and if it is not, it will assuredly be attacked by it whether the heels be cut off or not; again, the insect is much more likely to nestle within the fold of the double blade, and the fancied superiority of appearance has so little weight with the purchaser, as not to counterbalance the risk of probable deterioration and eventual loss. In damp and rainy weather the Mace should be dried by the heat of a charcoal fire carefully conducted, so as not to smoke it or blacken its surface.

The Nuts liberated from their Macy envelope, are transported to the drying house, and deposited on an elevated stage of split Neebongs placed at a sufficient distance from each other to admit of the heat, from a smouldering fire beneath, without suffering even the smallest Nuts to pass through. The heat should not exceed 140° of Fahrenheit, for a sudden inordinate degree of heat dries up the kernels of the Nuts too rapidly, and its continued application produces fissures in them; or a fermentation is excited in them, which increases their volume so greatly as to fill up the whole cavity of the shell, and to prevent them from rattling when put to this criterion of due preparation. The fire is lighted in the evening and kept up for the whole of the night. The smoking house is a brick building of a suitable size with

a terraced roof, and the stage is placed at an elevation of ten feet from the ground, having three divisions in it for the produce of different months. The nuts must be turned every second or third day, that they may all partake equally of the heat, and such as have undergone the smoking process for the period of two complete months and rattle freely in the shell, are to be cracked with wooden mallets, the worm eaten and shrivelled ones thrown out, and the good ones rubbed over simply with recently-prepared well-sifted dry lime. They are now to be regarbled, and finally packed for transportation in tight casks, the insides of which have been smoked, cleaned, and covered with a coating of fresh water and lime. If packed in chests, the seams must be dammered to prevent the admission of air or water. There is no necessity for sorting them, as, previously to their sale, they are classed into sizes in the Company's Warehouses in London.

The mode generally practised in preparing Nutmegs for the market, is to dip them in a mixture of salt water and lime, and to spread them out on mats for 4 or 5 days in the shade to dry. I am however convinced from much experience that this is a pernicious practice, not only from the quantity of moisture imbibed in this process, encouraging the breeding of insects and rendering the Nuts liable to early decay, but from the heating quality of the mixture producing fissures and occasioning a great loss in the outturn; whereas by liming them simply in the dry way as I have recommended, the loss ought not to exceed 8 per cent. In May 1816, I made some experiments on the subject. I cracked a quantity of Nutmegs that had been smoke-dried for 2 months, and distributed them into four equal portions. I prepared the Nuts of one parcel with a mixture of lime and salt water; those of the 2d were rubbed over merely with fine well-dried shell lime such as the natives use with their betel, although I have no doubt but that recently prepared and well sifted common lime would answer equally well; those of the third parcel were mixed, unlimed, with one third of their weight of whole black pepper; and those of the fourth, also unlimed, with the same proportion of cloves. They were then put into separate boxes with sliding tops, and numbered 1, 2, 3 and 4, in the order I have mentioned them. At the expiration of the first year they were all sound. After that of the second, I found three worm-eaten Nuts in No. 1, and two in No. 3, but those in Nos. 2 and 4 remained untouched. The injured Nuts were allowed to remain, and after the lapse of the third year, five worm-eaten ones were discovered in No. 1, three in No. 3, and two in No. 4, those in No. 2 being in their original state. Four years and four months have now elapsed since the commencement of these experiments, and upon examining the several parcels the other day, the number of decayed Nuts has not increased in Nos. 1, 3, and 4, those in No. 2 are as good as the day they were put into the box. These experiments not only prove the superiority of liming in the dry way, but also the fact that the progress to general decay in a heap of Nutmegs, even after the insect has established itself, must be a work of years. In the shell they will keep for a great length of time. I have myself kept them in this state for six years, and when cracked they were found perfectly sound. From the report of the London brokers however, they will not answer in Europe on account of the heavy allowance for shells, which is one third of the weight; but the Chinese merchants are in the daily habit of exporting them to Pinang and China, where they are in request. It is stated on the best authority, that unlimed, or brown Nutmegs as the home dealers call them, mixed with

cloves, as in experiment No. 4, are highly esteemed in England, and even preferred by some to the limed produce; most probably from the greater facility of detecting the flaws in them in their naked state.

Although the Clove-tree attains great perfection in the red mould of these districts, it is more partial to a less tenacious soil. Its cultivation has been established for many years in the West Indies and at Bourbon, and is of secondary importance only. The mother Cloves are planted in rich mould at the distance of 12 inches from each other, screened from the sun and duly watered. They germinate within 5 weeks, and when four feet high are to be transplanted at intervals of 30 feet, with a small admixture of sand with the red mould so as to reduce its tenacity; and to be cultivated in the same mode as the Nutmegs, only that when full grown they require less manure in the proportion of one third. They yield generally at the age of 6 years, and at that of 12 are in their highest state of bearing, when the average produce may be estimated at 6 or 7 pounds of marketable fruit each tree during the harvest, which takes place in the rainy months, but with us they have hitherto borne two crops in three years only. The fruit is terminal, and when of a reddish hue is plucked by the hand, so that the process of gathering it is tedious. It is then dried for several days on mats in the sun, until it breaks easily between the fingers, and assumes a dark brown color. It loses about 60 per cent. in drying. When past its prime, the Clove tree has a ragged and uncombed appearance, and I am led to suppose that its existence is limited to 20 years, unless in very superior soil, in which it may drag out a protracted and unprofitable state of being to the period of perhaps 24 years. Hence it becomes necessary to plant a succession of seedlings when the old trees have attained eight years of age, and this octennial succession must be steadily kept in view.

With reference to the number of labourers, cattle and ploughs, necessary for a plantation of 1000 Nutmeg or Clove trees after the ground has been thoroughly cleared of underwood and stumps of trees, I consider that 7 Chinese or active Bengalee labourers, 50 head of cattle, and 2 ploughs, would be sufficient for all the purposes of the cultivation, with the exception of collecting the Clove harvest, which being a very tedious process, would require an extra number of hands, and indeed the best plan would be to gather it in by contract.—*From a Paper by Mr. J. Lumsdaine, in the Proceedings of the Agricultural Society, established in Sumatra,* 1820.

OPINIONS OF THE PRESS.

THE following extracts have been taken from various of the newspapers to which copies of the first No. of the Society's Transactions have been presented; they will indicate to the members the opinions of a portion of the Press of India of the value of the publication which has just been commenced:—

WE have been favored with the Transactions of the Bombay Agri-Horticultural Society for April 1843. The contents of this Report are interesting; and they bear a valuable testimony to the good which has been effected by it, in bringing about great improvements in the produce of the fertile soil of India. In garden fruits, and vegetables—in mulberry plantations—in the cultivation of cotton—and, above all, in the cultivation of agricultural knowledge amongst the Ryots, and the uprooting of many of their prejudices—the most advantageous results have been reaped, which cannot fail to conduce much to the comforts of the rural population, and to the interest of Government. Our limits will not permit of our making extracts; nor can we at this present moment, after a mere glimpse over the contents of the Report, venture to extend our comments to any length. We however promise to revert to it at some length early next week; and the Society may depend that any effort will not be wanting on our part to promote the most praiseworthy objects which it has in view; if, through the instrumentality of the Press, we can hope to do so even in the smallest degree.—*Bombay Gentleman's Gazette, April* 27.

TRANSACTIONS OF THE AGRI-HORTICULTURAL SOCIETY OF WESTERN INDIA.—The April number of the transactions of the above named Society, has just been presented to our notice, and as we are well-wishers of the Agri-horticulturals, we take a short glance at its principal contents.

It appears that the first number of the Society's Reports was printed in the year 1838; edited by Dr. SMYTTAN, with a preface by Dr. KENNEDY. Since that time, although periodical publication of reports of proceedings was a leading object with the Society, no further issue made its appearance. It is now resolved that the transactions be published quarterly, and if the forthcoming numbers contain as much valuable matter as that now before us, we should say that the Subscribers will receive ample value for their annual subscription of Six Rupees.

The Annual Report for 1842 was read by the Secretary, Dr. BUIST. After paying a well-merited tribute to the memory of the late Secretary Dr. HEDDLE—the Report proceeds to give a favorable statement of the finances of the Society, although very heavy expences had been incurred in getting out from Scotland a head gardener at an outlay of Rs. 2000. The Society began the operations of the present year with a balance in their favor of nearly Rs. 3,000—a wire fence had been got out from England for the protection of the gardens, at the cost of £ 62—a Hydraulic belt under Rs. 100—and the printing of four numbers of the *Transactions*, with carriage, &c. amounted to Rs. 960—a very large amount in our estimation, and we are not by any means sorry to find that the system of send-

ing home to England, for printing the Transactions of the Society, is not likely to be acted upon in future, the late trial not having been productive of much satisfaction. We said at the time it was in contemplation to send home the MSS., and we now repeat, that printing can be very well executed in Bombay—and we have only in proof of our assertion to point to the new Rules of the Supreme Court, which lately issued from the American Mission Press, and which would reflect credit upon any Establishment either at home or abroad.

The Report goes on to mention the engagement of Mr. Joseph Shannon as head gardener, and his arrival in Bombay on the 11th November—the unsatisfactory supply of Seeds, and the resolution of the Society to procure them in future Overland from England.

After the Report had bean read and approved of—a solitary sample of Silk was produced by Mr. James, of which he had grown 40 lbs., and for which he was presented with a Silver Medal. Dr. Gibson remarked with great justice, "that it was not very encouraging that this should be the 14th or 15th year that they had been in the habit of giving prizes for specimens, and that, as yet, nothing but specimens had been produced. The cost of production of all the silk which had as yet been reported on, was *more than ten times its value.*"

Several prizes were awarded to the Mallies for fruits and vegetables. A very fine specimen of Sugar Candy was produced ; and a Bullock-Prize was directed to be given at the May meeting.

A paper on the cultivation of Sea-Island and Bourbon Cotton, by A. Elphinston, Esq , Collector of Rutnagherrie, gives some valuable hints upon the growth of that plant. Mr. Elphinston says, the soils best adapted for the cultivation of the Sea-Island Cotton plants, appear to be the alluvial land at the mouths of rivers : the black soil is not necessary for it—it will grow on any good land, but in sandy soil it is soon scorched up after the rains are over. The air in the vicinity of the Sea is supposed to be favorable to the plant. The Bourbon Cotton plants are perennials and attain the height of ten feet—it is distinguished from the indigenous Cotton of India by having black seed. The black Indian Cotton soil is not necessary for its cultivation ; it will grow on reddish or yellowish clay soil of good quality.

Mr. G. Mutti, Superintendent Silk culture at Kassimbeck Wargaon, describes the cross breed between an Egyptian male moth, and one of his own females, as "a very great improvement indeed for this country." Some remarks upon the plantation of Mulberry trees in the Deccan will well repay an attentive perusal, but they are too lengthy and full of calculations to be made available for our purposes, in this cursory glance at the contents of the *Transactions.*

The cultivation in the Deccan of the Mauritius Sugar Cane, appears to be flourishing ; as also the growth of Tobacco in the Kaira Zillah. We wish the collector would enable us to try the relative merits of *Tobaccos*—we could write with more effect upon the subject, if we could speak from experience of its soothing qualities.

Some practical observations on Carolina Rice, and Hemp, conclude the April number of the *Transactions.*

In concluding our brief notice of the quarterly number before us, we take leave to offer a few observations to the society. It is true that *some* good has resulted, and may be expected to result, from the labors of the Agri-

Horticultural Society—but no man in his senses could hope for grand consequences from such inadequate means. There are only 100 subscribing members—they subscribe, as we learn, 15 Rupees each per annum, in toto 1,500 Rupees per annum. What can such a sum be expected to achieve, where there are so many varied and important objects to accomplish? We would say then—increase your numbers if you can, and your subscriptions, which you may. Confine yourselves to a few objects, but work *them* out laboriously. Give each a full and fair trial, before you abandon it for another. Pay your head Gardener better—84 Rupees per mensem and a house, is insufficient remuneration for a man of any capability; and you should have no other but an efficient man in your employ at any price. Your secretaries are good gratuitous servants—but your work would be better done, if it was paid for—we cannot understand how labor of any kind can be satisfactorily performed, without adequate remuneration—it is a great incentive to exertion. If your means be limited—so ought your objects to be likewise—better to do *one* thing well—than a *dozen* only by halves.—*Bombay Courier, April* 28.

We have been favored by the Secretary, Dr. Buist, with the first number of the "Transactions of the Agri-Horticultural Society of Western India." We are much pleased with the manner in which the publication is got up. The contents have, in great measure, appeared from time to time in the columns of our contemporary of the *Times*,* and although on this account the articles are not fresh, the collected and connected form in which they now appear give them an increased value. As some of our Mofussil readers may erroneously suppose from the circumstance of the first No. of the Society's transactions being so recently issued, that the papers laid before the institution were not of sufficient merit to entitle them to a prior publication, we may observe, that the present publication, though purporting to be the first number, is in fact the first of a *new series*;—the former series having been published about five years ago under the able superintendence of Drs. Smyttan and Kennedy. To the Agri.-Horticultural Society, European residents and the natives of Western India are greatly indebted for the money and toil expended by its members in introducing many valuable exotics, contributing to the vegetable delicacies of our table, and developing the resources of India by the culture of the Mulberry tree, Sugar Cane, Flax, &c.; and to the publishing Committee our best thanks are due for giving to the world the valuable materials contained in the pamphlet now before us. —*Bombay United Service Gazette, April* 28.

We have been favored by the Committee of the *Agri-Horticultural Society of Western India*, with a copy of the first No. of their Transactions for the present year, which contains also the Annual Report of the Society for 1842. Since 1838, when the first No. of the Transactions was published, no report of the state of the Society has been issued until the appearance of the present No.; but arrangements have

* This is a mistake: none of the articles referred to were ever before published, except the Report of the Society's Meeting of the 15th February,—which appeared in the *Bombay Times* of the 18th.—*Secy. Agri.-Horticultural Society.*

now been made, we are glad to learn, for the quarterly publication of papers which may be the means of disseminating information on subjects of the greatest importance to those engaged in cultivation. The periodical now before us consists of sixty four pages of matter got up in a most creditable manner, and contains, together with several other interesting articles, papers on the cultivation of Sea-Island and Bourbon cottons, the plantation of Mulberry trees, the cross breed of Silk worms, the cultivation of Sugar Canes, Hemp, and Tobacco, and a memorandum on the raw Silk of Cabool by Mr. Charles Masson. Considering the low price charged for this journal, six Rupees per annum or two Rupees for a single copy, it is not too much to hope that it may be liberally supported. We are glad to find that the Honorable the Governor of Bombay has accepted the office of Patron of a Society which is calculated to do so much good, and that the members have reason to be gratified at the present state of affairs and future prospects thereof.—*Madras Record, April* 29.

Scarce a fortnight has elapsed since we were reluctantly compelled to remark on the thin attendance of the members at the meetings of our Agri-Horticultural Society ; to regret the languor with which its important objects seem now to be carried out, and finally to hope that under the auspices of our present Governor, himself an eminent practical Agriculturist, the original designs of this useful Institution might be carried into effect with renewed life and vigour. We may now point to a worthy example set by our neighbours of Bombay, whose efforts, so far as we can judge from the first number of their "Transactions," just received, (and intended hereafter to be issued quarterly) embrace a wide range of those important—in fact national objects, which we would gladly see pursued with energy and effect in this Presidency.

Following the annual Report of the Society for the year 1842, we find a good practical paper on the cultivation of Sea Island and Bourbon cotton, by A. Elphinston, Esq., Collector of Rutnagherry. We then find a memorandum which well exemplifies the influence of an improving spirit among the ryots in the Deccan, 71 of whom are shown to have planted 8,548 mulberry trees and near 14,000 feet of hedges. The distance of the trees, the soil, and the mode of irrigation, are also stated. Mr. Mutti, well known for his valuable labours in the production of silk, contributes some remarks on silk worms, and on the mulberry plantations of the Deccan. Mr. Charles Masson, the enterprising traveller in the countries beyond the Indus, gives a memorandum on the raw silk of Cabool. An official letter from the Collector of Poonah, bears testimony to the successful progress of Mr. Mutti's exertions in extending mulberry plantations throughout numerous villages in his Collectorate, in which he states also the cultivation of cotton is on the increase. Mr. Rose, Assistant Collector of Poonah, notices the cultivation of the Mauritius Cane. Mr. Kirkland communicates a practical memorandum of the mode of cultivating Tobacco in the Kaira Zilla, showing every item of expence and the balance of profit to the cultivator. Mr. Elphinston furnishes a statement showing the results of the experiment of cultivating Carolina rice in several of his Talooks. The Transactions are concluded by some notes upon the cultivation of hemp, and a tribute to the late Secretary of the Society, Dr Heddle.

We look upon this, the first number of the Transactions of the "Agri-

Horticultural Society of Western India," as highly creditable to the Society from which it emanates. The great object of promoting the cultivation of foreign and more valuable species of Agricultural produce, and thus increasing the wealth and prosperity, and extending the exports of the country, has evidently excited that interest of which it is so well deserving, and it is worthy of remark that the numerous contributions of Bombay Civilians, show that they by no means participate in the extraordinary and ill-judged sentiments of one of their number, whose apathy to improvements was the means of banishing the American Cotton experiment from that Presidency. —*Madras Spectator, April* 29.

We are indebted to the courtesy of the Committee of the Agri-Horticultural Society of Western India for a copy of the first number of their Transactions for the current year. On the formation of the Society, it was one of its leading objects to publish periodically reports of its proceedings, and other papers that might be forwarded to it 'on subjects of Agriculture, Rural Economy, or Gardening, or any other matter coming within the scope of its institution.' From causes not enumerated, the Society's intentions, in this respect, were not carried into effect, till the year 1838. In that year the first report was published, but in the following one, it was discontinued, and resumed in 1842. The four subsequent numbers were sent to Europe and there printed. The series from 1838 to 1842 are now complete, and the number under notice, forms the sixth publication of the Society's Transactions. They are for the future to be printed quarterly and sold at the charge of 2 Rupees per copy for single numbers, or Rupees 6 annually of permanent subscription. When it is recollected that the Society's operations embrace the whole of Western India, and that a mass of highly valuable information, which will occupy years to exhaust, are open to the Society's research, we think the publications issued from the press under the auspices of this Association, will form a valuable library on subjects of Agriculture, and Horticulture; in fact, on every thing relating to Agrarian and Rural Economy.

The contents of the present number are replete with interest, and the papers on the Mulberry tree are valuable. Those on the cultivation of Sea Island and Bourbon cotton and tobacco, are in every respect deserving the attention of practical men, who will find some useful hints, which might be incorporated on the system in vogue with them. So many eminent philosophers of our own times have turned their attention to Agricultural investigations, that we cannot but hail, with no ordinary interest, the publication of the Transactions of the Agri-Horticultural Society of Western India. Sir Humphry Davy wrote on agricultural chemistry, and Professor Liebig on organic chemistry. The names of Dr. Daubeny, professor of Agriculture at Oxford, and Professor Johnston of Durham, must be familiar to most readers who take an interest in the subject under notice. Agricultural Associations are no longer confined to favored localities, but are springing up in every part of the civilised world, and through their agency, what had hitherto been a sealed book to the bulk of mankind, is open to every one who may seek for such information. It is a curious fact in agricultural history, that India should be one of the most wretchedly cultivated countries in the world—abounding as she does in every variety of vegetable riches, with China for her neighbour, where Agri-Horticulture

has been carried to such perfection, that the agriculture of Europe is infinitely inferior to that of the Celestial empire. The latter, says Professor Liebig, is the most perfect in the world. It would thus appear fortunate for the interests of mankind, that the middle wall of partition which had hitherto separated the subjects of the son of heaven from the rest of the habitable globe, has been removed,—and we have every reason to hope, that as 'half a century sufficed to Europeans, not only to equal, but to surpass, the Chinese in the arts and manufactures,' so a less period will suffice to surpass them in their hitherto unrivalled system of agriculture. It would be well to suggest to all the Agricultural Societies in India to open a correspondence with our countrymen in China, with a view to acquire correct information of the Chinese system of Agri-Horticulture, and if a Society could be formed at Hong-Kong, in communication with the Societies in India, the benefit that this country would reap thereby would be incalculable.

The Agri-Horticultural Society of Western India, has, after surmounting many difficulties, commenced publishing its Transactions; for many years the Bengal Agricultural Society has favored the world with its researches; the infant Association in Ceylon, has also put forth a number or two, but the Agri-Horticultural Society of Southern India, has not yet given the reading public of the Benighted the benefit of its investigations. Why and wherefore, we are unable to say. To those who take an interest in the spread of agricultural knowledge, the Societies already formed, and the progress already made, must be highly satisfactory to them. New institutions are springing up. Only the other day a Society was formed at Agra, and we hope to see others established throughout the land, either as principals or auxiliaries. But these institutions must bear in mind 'that the principles of rational agriculture are within the domain of science, and that from science alone, when called in to aid the zealous agriculturist, can we hope for real and permanent improvement.'—*Madras Circulator, May* 1.

We have been politely favored with a copy of the first number of the Transactions of the Agri-Horticultural Society of Western India, published at Bombay; which will, we have every reason to believe, prove a valuable work. It has always appeared to us that the advantage of such Societies is nearly, if not quite, neutralized when no report is published of their Transactions—being formed, as they profess themselves to be, for the *diffusion* of knowledge; and we are therefore glad to learn from the prospectus of the work, that "It had, when the resumption of publication was determined on, been agreed that, from and after the begining of 1843, the Transactions of the Society should be published Quarterly, and in an enlarged form: these, besides original matter, to include papers selected from published works, such as might be unlikely to fall into the hands of the generality of readers in India, and were calculated to impart important information on subjects connected with the objects of the Society." This appears to us extremely judicious, as very many persons who either have never heard of some of the valuable works published on these subjects, or who may not be in such circumstances as to afford the purchase of them, will be able without inconvenience to gather much information from this periodical at Rupees 6 annually.

We observe in this opening number, some valuable instructions as to the soil and treatment best suited to the cultivation of Sea Island and Bourbon

Cottons, from the pen of A Elphinston, Esq., Collector of Rutnagherrie; as well as several accounts of the progress of the plantation of Mulberry trees in the Deccan, giving at the same time a very interesting account of attempts to cross the breed of silkworms; in which it seems likely that perseverance and ingenuity will be rewarded with signal success.

On the whole we think our readers will find this a valuable as well as interesting periodical; and before we conclude these remarks we trust we may be permitted to express the hope, that contributions may be acceptable even from Southern India.—*Madras Christian Herald, May* 3.

We have to plead to an omission in not before noticing the report of the *Transactions of the Agri-Horticultural Society of Western India.* Though the Society has existed since 1830, not more than two reports have been laid before the public, and these at such distant intervals, as to excite the fears of the friends and advocates of Agri-Horticulture in India, that its affairs were not progressing in so satisfactory a manner as could be wished. The members of this body have not made much noise, but it is beyond dispute, that they have never lost sight of the important objects involved in their undertaking. It is most gratifying to witness the efforts of the three Indian presidencies with relation to the cultivation of the soil, a subject but little understood by its native cultivators, with whom, in point of fact, no motive seems ever to exist beyond providing the means of immediate subsistence. Scientific experiments for the improvement of their machinery and the implements of husbandry, never entered their heads, and in this rude state they must have continued, but for the establishment of Agri-Horticultural Societies among them. In process of time, our modes and plans will be better understood, and out of this increase of knowledge will arise vast advantages to the aborigines, independently of the impetus that will be given to commerce throughout the country. That India is destined eventually to supply Great Britain with almost every article known or valued in trade, admits of no doubt, and the great contributors to this result must be looked for in our Agri-Horticultural Societies. Calcutta and Bombay take the lead, it is for Madras to copy their example. Every one who has watched the progress of the society established here must have witnessed with pleasure the signs of improvement in this department of labour; still, to be effective upon a more extended scale, much more energy is needed, and if to this we add more activity, we think we do no injustice to the collective body. The proceedings of all the Societies are unavoidably retarded from the indisposition of the natives to what they foolishly conceive to be unprofitable innovations; to overcome which, it is necessary by repeated successful experiments, to demonstrate the injustice they do themselves by refusing to adopt the improvements of science and the advice of practical men well versed in the art of Horticulture and husbandry.

Among the things that have astonished us with reference to these Societies, is the conduct of the Government in the withdrawal of free postage to their communications. The object of these separate bodies, has nothing sinister in it, they labour for the good of all, and look for no other compensation than the pleasure of knowing that their labours are succeeded with beneficial results to the whole population. In proportion as the face of the country improves, the Honorable Company are gainers, and yet strange to say, in reply to the letter of Sir J. P. Grant—the Secretary writes as follows:—

"I am directed to state that His Honour in Council regrets that, consistent-

ly with the just demands of the State, he cannot alter the orders already passed on the subject."

The Court of Directors were subsequently referred to, and it will be seen that they have taken a more favourable view of the matter : and it is fair to infer from their answer that, when a direct and regular communication between Suez and Calcutta is effected, they will have no objection to meet the wishes of all the Societies of this kind in India to have their seeds transmitted free of all charge. We do hope the Court of Directors will see the propriety of declaring the reports and correspondence of these Societies free of all postage ; it is not creditable to them, seeing they are the principal gainers by such exertions, to lay a tax upon them in their passage through the country.—*Madras Athenæum, May* 9.

While on the subject of gardens we are happy to perceive, by the receipt of No. 1 of a proposed quarterly series of Transactions of the Agri-Horticultural Society of Western India, that that institution has again come into more active operation. We have perused the number with much interest, and only regret that our space will not admit of our entering into any detailed analysis of its contents. The report for the year, prefixed to the transactions, shews a healthy state of funds, a desire to introduce many of the Horticultural improvements in use at home, and an activity which will, when it becomes more generally known by means of the Society's transactions, increase the sphere of its utility and procure a high place for it amongst the scientific institutions in India. The western coast of the Peninsula is especially open to great improvements in agriculture, and Gujerat presents the fairest field for its operations. We would strongly recommend to the Members to direct their attention to the capabilities of Mount Aboo as affording an excellent ground for acclimatizing European plants, for which the Mahabuleshwur hills are, on account of the violence of the periodical rains, not quite so well suited. We wish the Society all the prosperity it may deserve.—*Delhi Gazette, May* 6.

We have been favoured with a copy of the Quarterly proceedings of the Bombay Agri-Horticultural Society, which is a most creditable production, considering the difficulties which, according to the preface, beset the getting up of such a work. From it we have met with a plan for fencing gardens, which we have the greatest pleasure in extracting for the benefit of all who may wish to adopt so neat and elegant a style of fencing—

" The fence along the bottom of the slope of the flag-staff hill having in part been for some time in so ruinous a state as to admit cattle into the gardens, and the remainder having been entirely destroyed by the rains, it appeared by estimate that the lowest rate at which it could be replaced by a wall was Rs. 300 per 100 yards. It having been suggested, that for half this, a wire fence of the finest construction could be got out complete from England, 400 yards of this variety of enclosure arrived ten days since, at a cost of £62, —including painting, packing, land-carriage, freight, and insurance : the charge for putting it up would probably carry up the whole to Rs. 700—or at the rate of a little over 1¾ Rs. a yard, as originally estimated. Very full information in reference to the qualities of this variety of enclosure had been collected, and several experiments made upon it in Bombay. From this it appeared, that wire fences 3½ feet high were now extensively employed on sheep and

cattle pastures, and were found sufficiently strong for all purposes of protection. Where wooden uprights were employed, they had, in Scotland, been occasionally completed on the largest scale for 7d. a yard : and might be so in India, by the use of jungle-wood and bamboos, for Rs. ½. The height of the fence now received being 4½ instead of 3½ feet, and consisting of 8 wires instead of 5, besides having its uprights of the finest wrought iron, was the cause of the very high charge of Rs. 1½. How far this might be serviceable to the ends of the native cultivator, remained to the seen : there could be no doubt of its beauty and excellency as an enclosure for every description of European or Oriental compounds. It was light, airy, and durable, and eminently suitable for training vines, or any variety of creeping plants."

There is some interesting Correspondence on various subjects of Agriculture, such as Tobacco, Hemp, Carolina Rice, Cotton, and on the rearing of Silk-worms, on the latter of which is a report in the shape of remarks, showing the success of patient perseverance in overcoming the prejudices of the natives :—the following extract from the remarks does honour to Mr. Vibart, the Commissioner of Revenue at Poona :—

" It should be considered also, that the Ryots have steadily pursued the planting of the mulberry tree in the teeth of the prospects held out to them of immediate pecuniary aid, and comparatively advantageous return within the year by the cultivation of the mulberry bush and sugar cane, and even under the circumstances of the advantages of the mulberry tree being depreciated as an undertaking which rendered years necessary before any adequate return could be hoped for. The tree, moreover, does not offer advances of money, nor agreement to take the product. Notwithstanding these very important circumstances, the applications for the plantation of the standard mulberry tree are numerous, and we see people sinking wells, preparing and levelling waste land, with their own money, to plant mulberry trees. This, I hope, fully confirms again what I have always stated,—that in the quiet prosecution of the plans I have laid down, consisted the improvement of this peculiar country, and that the Capital was not the centre and life of improvements. The desideratum to ameliorate this country is persuasion, patience, and perseverance, in teaching the natives to open their eyes to their own interest, and to stir up a spirit of competition and emulation."

Alluding to the difficulties experienced in introducing a new cultivation among the natives, Mr. Vibart remarks :

" In fact, some were of opinion that nothing could be done without the establishment in various places of experimental gardens ; the grant of land, rent free, for planting mulberries ; and advance of money to the Ryots by Government or capitalists. Some again supposed that nothing could be effected without the settlement of capital in the undertaking, and the display of European workmanship and skill : others, that the mulberry could not succeed in this country as a standard tree—that the mulberry bush system was to be adopted, being the best one—that the " Philippina" species was the best,—and the St. Helena, which from its superiority is incomparable, was not good. Some, on the other hand, assumed on the grounds of their knowledge of the native character, that the natives will never be able to wind silk—that those of the higher castes will have nothing to do with its cultivation at all—that in Bombay the mulberry, worms, and silk could not succeed—and, to render bad worse, some had ventured to propagate the extraordinary opinion, that the Ryots could not afford to rear the mulberry as a tree—that there was no place in the Dekkan, nor any quantity of good soil, for the cultivation of the mulberry tree—that the trees would interfere with inferior cultivations, and that the bush should be adopted.

" Notwithstanding such a variety of conflicting opinions, the settlement of the sugar and bush undertaking—the scanty support given to the *Tree* Silk Cul-

ture Establishment—the obstacles and other contrarieties all turned out the reverse of the general opinion ; and time, I will venture to assert, will yet more fully develope the great utility and success of this undertaking. Let it be finally considered—that it is only two years and a-half since the Ryots have began to plant not trees, but the first mulberry slips and seed in nursery."

So it will ever be : nothing but an indomitable resolution, which is not turned aside or disgusted by obstacles, or partial failures, will ever succeed in introducing new productions, or improved modes of cultivation. We shall be glad to receive the future numbers of the Society, and to extract any interesting matter which may be of use to our readers.—*Agra Ukhbar, May* 4.

We have to acknowledge the receipt of the first No. of the Transactions of the Agri-Horticultural Society of Western India, for which we are indebted, primarily, we believe, to the liberality of the Institution, which is anxious to diffuse correct information on Agriculture and gardening, and, secondarily, to the courtesy of the Secretary Dr. Buist, whose varied talents are so usefully employed in instructing the public in different departments of human knowledge. We shall probably best meet the wishes of the Society by noticing such parts of their work as seem applicable to the state of Ceylon ; and to those anxious for the improvement of our Island it affords many valuable suggestions.

Though comparisons are generally odious, there are some salient points in the constitution of the Bombay Society, to which it seems advisable to call the attention of the Ceylon Agricultural Society.

The income of the Bombay Society from *Subscriptions* in 1842 was only Rs. 1,500. But with the Government grant, sale of seeds &c., the sum for disposal in 1843, is estimated at Rs. 8,000 or £800. With this limited income how is it that the Bombay Society effects so much good? In the first place we learn that, excepting the Head Gardener—a European—who receives Rs. 1200 a year, they "*have no paid officers.*" They do not then act as the Ceylon Society does, give nearly their entire subscriptions to pay an unqualified Secretary ; they therefore deserve and obtain the pecuniary support of Government ; and before the Ceylon Agricultural Society apply to the Legislative Council for a grant, they ought to place themselves in a similar position.

Instead of having one Committee to attend to all departments, like the Society in Kandy, the business of the Bombay institution is conducted by separate small and responsible committees—viz. a General Committee, to which all matters, not strictly belonging to the other departments, are referred, and which are, during the year, when no meeting of the Society assembles, permitted to exercise all its powers; the Garden Committee, which meets monthly ; the Committee on prizes ; and the Committee on papers—the General Committee being the largest, the others consisting of only 3 or 4 members each.

Dr. Buist, whose scientific attainments are well known, having been unable to devote so much of his time to their affairs as he did previously, in consequence of his removal to the Bombay Observatory, the Society associated with him, as Joint Secretary, Dr. Geraud, "a gentleman who had just arrived from London bearing with him the highest testimonials to his ac-

quirements as a botanist and a vegetable physiologist." Besides these two, they have a Native Secretary, Cursetjee Jamsetjee, Esq.

Now with reference to these two last features in the Bombay Society, although the Ceylon Society may be unable to furnish gentlemen who can make it convenient to form different working Committees, or to obtain the assistance of persons possessing such scientific attainments to act as Secretaries,—they might, we think, combine to a very advantageous extent, both objects by the appointment of two or three Secretaries—each bringing a separate department under the notice of the present General Committee.

The appointment of a Native Secretary is also most desirable, as it would be the means of imparting information to the Kandians, and giving them an interest in the proceedings of the Society.

We have looked carefully through the proceedings for the traces of any purely honorary offices in the A. H. Society of Western India, and can find only one alluded to—that of the Governor, who is Patron. In this respect also, the Ceylon A. Society would do well to imitate, for, without entering into unpleasant particulars, or passing any judgment on conflicting opinions, it may be safely asserted that nominations of this kind have given rise to a bitterness of feeling and party spirit most injurious to the well-being of the Institution.

The last point to which we shall call the attention of the members of Ceylon A. Society, is the principle upon which their Bombay contemporaries regulate their prizes, as it appears to have been materially overlooked in the list of prizes which were lately offered here. In Bombay the quantity of an article for which a premium is offered is placed within the compass of every cultivator's ability to produce, and the circle of competition is thereby extended to its utmost verge even amongst the Natives. Now (overlooking many of the conditions which it will be impossible to comply with, so that the Society need not fear being ever required to pay some of the best prizes) how many of the Kandians we should like to know, will ever cultivate an acre of potatoes, which is the smallest quantity competent for a prize? and the same observation applies to several other articles.

It having been found that seeds obtained from the Cape were not always good, and generally excessively dear, the Society have adopted the plan of getting them out Overland, which will cost only about 4s. per lb. freight.

The mode suggested by Lieutenant Giberne, and agreed to by the Society, is that "the seeds should be sent out in February or March, and so pass through Egypt in the cold season: that they should be packed in strong paper, and on no account hermetically sealed. They would then be ready for distribution before the rains. Soft seeds, such as those of the horse chesnut, Spanish chesnut, acorns, &c., should be sent out in honey: —mangoe seeds might be sent home in the same way." Parties in Ceylon desirous of procuring European Seeds should adopt this plan.

They made enquiries respecting the Manilla Hemp, which is known to be so valuable, and ascertained that the wild Plantain which grows in the Ghat Ravines is identical with the Manilla abaca. But as the Ghaut does not exceed 1½ feet in the stem (whilst that of Manilla attains 7 feet) it is thought that the fibre would be too short for valuable cordage.

A letter from Manilla gives the following directions respecting this valuable product:—

"The process of preparing the Hemp for market is the most simple that can be imagined. The tree after being cut down, has the bark

peeled off—which bark is strewed in the sun to dry, and afterwards with a sort of carding instrument is separated into the threads in which you see the Manilla Hemp. The Trunk is the only part of the tree from which the bark is used."

We allude to this in hopes that some person will test the wild Plantain that grows so abundantly in parts of the interior of Ceylon, where we have seen it 5 or 6 feet in the stem.

The greater part of the work is taken up with papers upon the cultivation of the Mulberry tree and the production of silk. It sounds extraordinary in our ears in this fertile Island to hear of Mulberry trees being cultivated by irrigation, and yet it is under such disadvantages that the Bombay Government and this Society are encouraging the production of Silk. Surely in Ceylon, where the Mulberry grows so luxuriantly, and is so continually clothed with abundant foliage, that a few cuttings stuck in the ground become a thick screen in a few months, the preparation of Silk would be a most profitable undertaking.

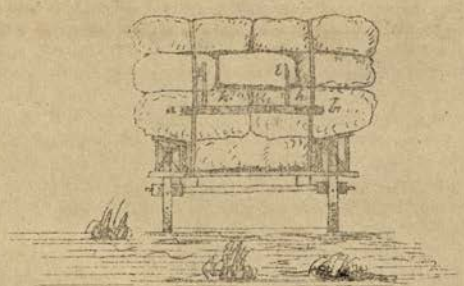
The Cotton Planters about Jaffna will find some valuable information on the object of their attention. Indeed we may take the opportunity of recommending all persons engaged in tropical agriculture and planting to take in these transactions, which are published quarterly at an annual subscription of only six Rupees, single copies two Rupees.—*Colombo Observer, May* 11.

Dimensions of N°. 1st

Axle - of Iron 1 Inch and ½ Square cylindrical arms 1½ inch Diameter.

Bed 3.9 in Long 4½ wide 6 deep.

Wheels - upright b. 6 high - Tyres 2½ inch, Naves 11 inches long
10 inches diam.r barrelled for convenience of hooping the Nave
Spokes thick 1½ inch - wide at Nave 3½ tapering to tyre
Felloes.....2½.....deep 3½ —

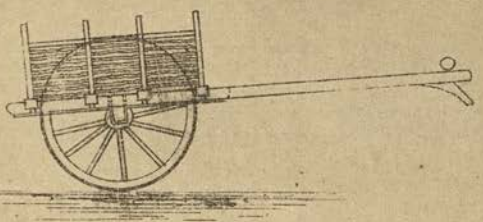


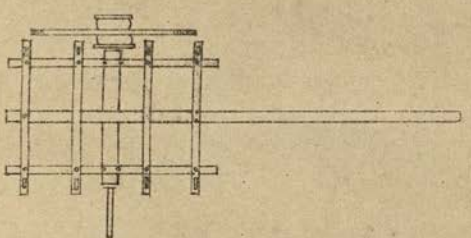
The above may explain the windlass for Binding bulky loads to a Cart.
The ropes are inserted into clefts at the ends of the roller a. b.
two short levers l. l. shipping into holes. h. h. wind the rope taut, and
being left in the sockets hold the load firm as long as required —.

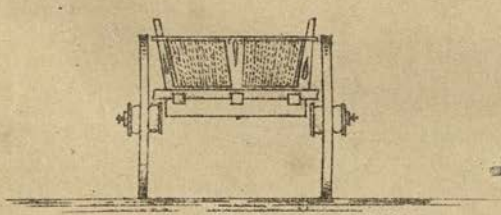
N°. 2nd With a heavier Wheel and Axle would answer for 1½ Tons.
but is here shewn with wheels and axle similar to those of
N°. 1st which are sufficient to sustain any weight of light bulky
good that can be conveniently laden on a Cart. The frame b.
is supported additionally by a bar. a. resting on the Axle, and
removable at pleasure —.

No. 1st Labor Cart.

to be drawn by two Bullocks

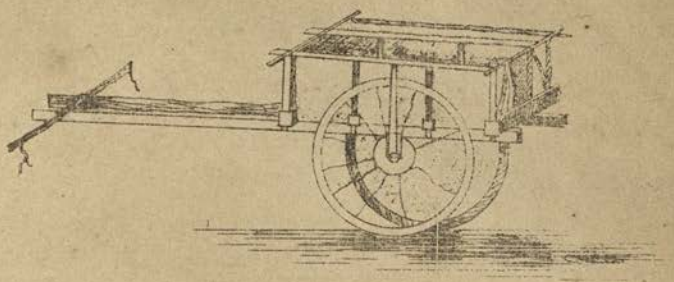


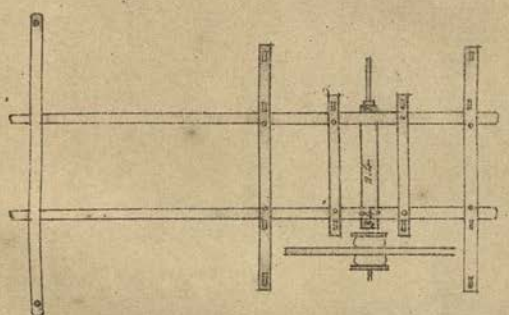


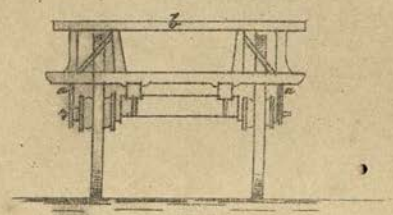


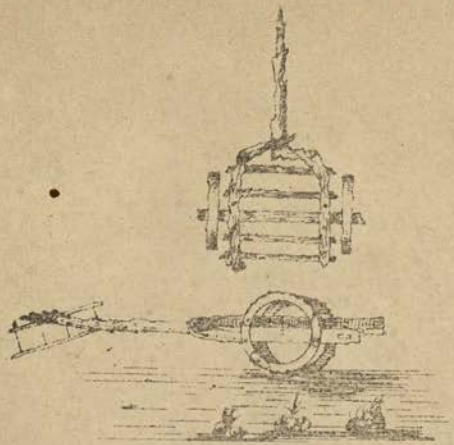
Scale 3/8 Im. to 1 Foot

No 2nd Cotton Cart
to be drawn by three Bullocks

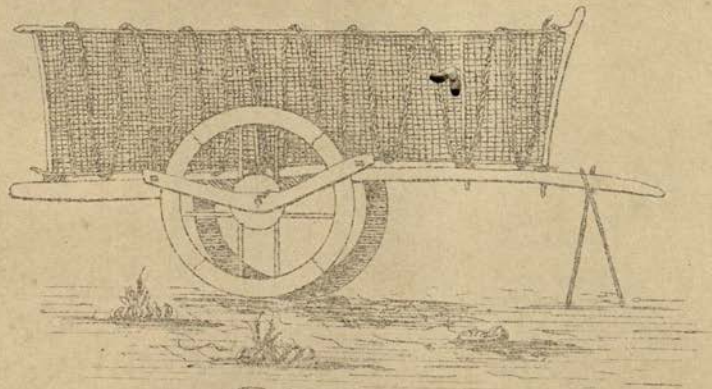








The Sindia Cart



The Delhie Cart

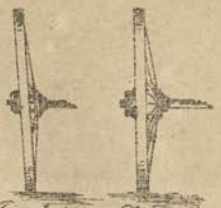


Fig. 4.

Fig. 3.

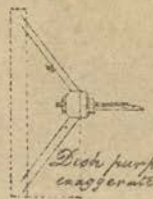


Fig. 2.

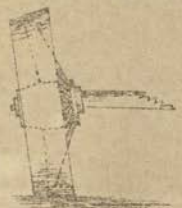


Fig 1. Coned Wheel.

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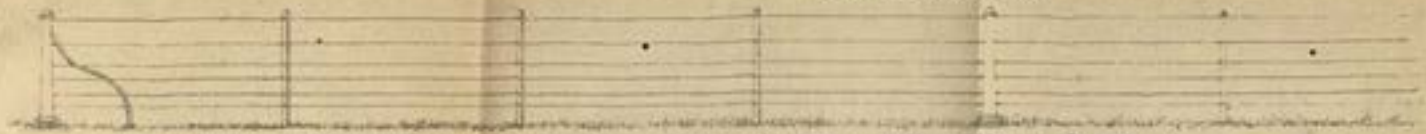
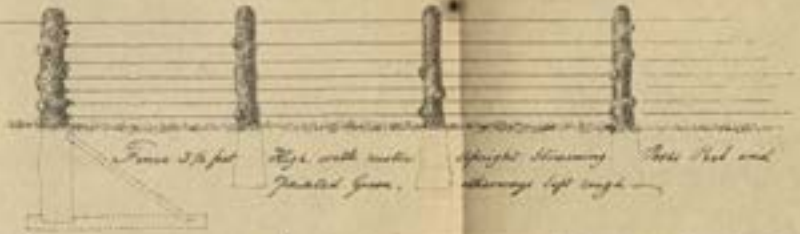
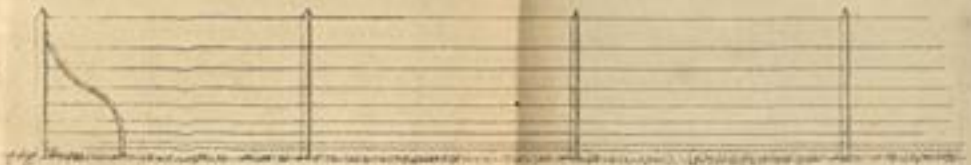
Wire Fences

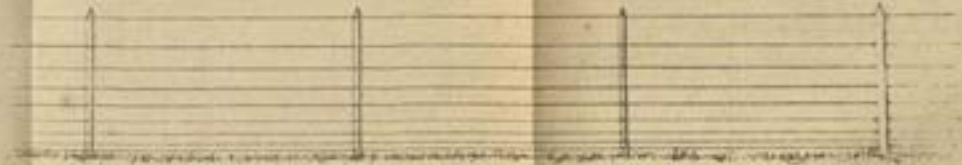


Fence 3½ feet high with Straining Posts, strong Upright of Cast and Light Upright of Wrought Iron. Hilgrave, Berkshire.

Fence 3½ feet High with Wooden Straining posts and Iron Upright. Hilgrave, Berkshire.

Fence 3½ feet High with wooden Jointed Iron, Upright Straining Posts Red and Strongs left Angle.



Fence 4½ feet High at the Garden of the Horticultural Society Bombay.



It has 9 Wires, all the Upright are of Wrought Iron.

Gate about to be made

Gate Posts

Digitized with financial assistance from
H T Parekh FOUNDATION
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